Chapter 3
AFFECTED ENVIRONMENT

3.0 INTRODUCTION

This Chapter describes the affected environment, including the cultural, historical, social and economic conditions that could be affected by implementation of the alternatives described in Chapter 2. Aspects of the affected environments described in this chapter focus on the relevant major issues presented in Chapter 2. Certain critical environmental components require analysis under BLM policy. These items are presented below in Table 3.0-1.

Table 3.0-1 Critical Elements Requiring Mandatory Evaluation

Mandatory Item	Not Present	No Impact	Potentially Impacted
Threatened and Endangered Species			X
Floodplains		X	
Wilderness Values	X		
ACECs	X		
Water Resources			X
Air Quality			X
Cultural or Historical Values			X
Prime or Unique Farmlands	X		
Wild & Scenic Rivers	X		
Wetland/Riparian		X	
Native American Religious Concerns			X
Hazardous Wastes or Solids		X	
Invasive, Nonnative Species			X
Environmental Justice		X	

3.1 AIR QUALITY

The climate of the project area is classified as mid-latitude semi-arid steppe (Trewartha & Horn, 1980). Steppe climate is characterized by large seasonal variations in temperature (cold winters and warm summers) and by precipitation levels that are low, but still sufficient for grasses. For more information on climate, see the Air Quality Technical Report for the Badger Hills POD environmental assessment.

Table 3.1-1: Summary of Existing Air Quality and Climate in the CX Field Region

Air Quality Component	Comment
Climate	
Temperature	Mean annual maximum: 60 °F Mean annual minimum: 32 °F
Precipitation	Mean annual precipitation: 14.7 inches Mean annual snowfall: 37.7 inches Mean annual snow depth: 1 inch
Air Pollutant Concentrations	
MAAQS & NAAQS: Criteria pollutants from 1993 – 2003 Rosebud County, Montana	• NO_2: o 1 hour < 15% of MAAQS o annual < 10% of MAAQS • PM_{10} o 24 hour: o 1 exceedance 2003 o annual < 70% of MAAQS • SO_2 o 1 hour < 20% of MAAQS o 3 hour < 5% of NAAQS o 24 hour < 5% of MAAQS o annual < 10% of MAAQS
PSD Class I Increments (MDEQ, 2002)	• Yellowstone National Park o .02% of PSD Class I NO_2 annual o .6% of SO_2 annual o 11% of SO_2 24 hour o 7.2% of SO_2 3 hour o .1% of PM_{10} annual o 2% of PM_{10} 24 hour • North Absaroka Wilderness o .04% of PSD Class I NO_2 annual o 2% of SO_2 annual o 15.6% of SO_2 24 hour o 12.3% of SO_2 3 hour o .3% of PM_{10} annual o 3.9% of PM_{10} 24 hour • UL Bend Wilderness o .02% of PSD Class I NO_2 annual o .6% of SO_2 annual o 11% of SO_2 24 hour o 7.2% of SO_2 3 hour o .1% of PM_{10} annual o 2% of PM_{10} 24 hour • Northern Cheyenne Reservation o 50% of PSD Class I NO_2 annual o .25% of SO_2 annual o SO_2 24 hour exceedance o SO_2 3 hour exceedance o 3.5% of PM_{10} annual o 28% of PM_{10} 24 hour
Visibility	
Yellowstone National Park	• Cleanest 20%: 140 – 168 miles • Average:93 – 125 miles • Haziest 20%: 59 – 78 miles
Atmospheric Deposition	
Little Big Horn Battlefield National Monument	• Precipitation o pH: very slight acidification in 1998 & 1999 o SO4: <.8 mg/L • Wet deposition o SO4: < .4 kg/ha
Yellowstone National Park	• Total Sulfur: <50% of guidelines

Under the Clean Air Act of 1970, EPA developed primary and secondary National Ambient Air Quality Standards (NAAQS) for each of the six criteria pollutants: carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter and sulfur dioxide. These standards establish pollution levels in the United States that cannot legally be exceeded during a specified time period.

Primary standards are designed to protect human health, including "sensitive" populations, such as people with asthma and emphysema, children and senior citizens. Primary standards are designed for the immediate protection of public health, with an adequate margin of safety.

Secondary standards are designed to protect public welfare, including soils, water, crops, vegetation, buildings, property, animals, wildlife, weather, visibility and other economic, aesthetic and ecological values, as well as personal comfort and well-being. Secondary standards were established to protect the public from known or anticipated effects of air pollution.

Montana has adopted additional state air quality standards that are at least as stringent as the NAAQS. These Montana Ambient Air Quality Standards (MAAQS) establish statewide targets for acceptable amounts of ambient air pollutants to protect human health. NAAQS and MAAQS establish upper limits for concentrations of specific air pollutants. Table 3.1-1 summarizes the NAAQS and MAAQS.

Table 3.1-2 National and Montana Ambient Air Quality Standards

Pollutant	Time Period	Federal (NAAQS)	Montana (MAAQS)
Carbon Monoxide	Hourly Average	35 ppm [a]	23 ppm [a]
	8-Hour Average	9 ppm [a]	9 ppm [a]
Fluoride in Forage	Monthly Average		50 µg/g [b]
	Grazing Season		35 µg/g [b]
Hydrogen Sulfide	Hourly Average		0.05 ppm [a]
Lead	90-Day Average		1.5 µg/m^3 [b] (rolling)
	Quarterly Average	1.5 µg/m^3 [b] (calendar)	
Nitrogen Dioxide	Hourly Average		0.30 ppm [a]
	Annual Average	0.053 µg/m^3	0.05 ppm [b]
Ozone	Hourly Average	0.12 ppm [c]	0.10 ppm [a]
PM-10 (existing)	24-Hour Average	150 µg/m^3 [d,j]	150 µg/m^3 [d,j]
	Annual Average	50 µg/m^3 [e]	50 µg/m^3 [e]
PM-10 (revised	24-Hour Average	150 µg/m^3 [f,j]	
	Annual Average	50 µg/m^3 [e]	
PM-2.5	24-Hour Average	65 µg/m^3 [g,j]	
	Annual Average	15 µg/m^3 [h]	
Settleable Particulate	30-Day Average		10 g/m^2 [b]
Sulfur Dioxide	Hourly Average		0.50 ppm
	3-Hour Average	0.50 ppm [k]	
	24-Hour Average	0.14 ppm [j,k]	0.10 ppm [a,j]
	Annual Average	0.03 ppm [k]	0.02 ppm [k]
Visibility	Annual Average		3 X 10 -5/m [k]

Source: http://www.deq.state.mt.us/AirQuality/Planning/Air_Standards/AIR_STANDARDS.pdf

[a] Federal violation when exceeded more than once per calendar year.

[b] Not to be exceeded (ever) for the averaging time period as described in the regulation.

[c] Not to be exceeded more than once per year averaged over 3-years.

[d] Violation occurs when the expected number of days per calendar year with a 24-hour average above this concentration is more than one.

[e] Violation occurs when the expected annual arithmetic mean concentration is above this concentration.

[f] To attain this standard, the 99th percentile of the distribution of the 24-hour concentrations for one year, averaged over three years, must not exceed this concentration at each monitor within an area.

[g] To attain this standard, the 98th percentile of the distribution of the 24-hour concentrations for one year, averaged over three years,

must not exceed this concentration at each monitor within an area.
[h] To attain this standard, the 3-year average of the annual arithmetic mean of the 24-hour concentrations from a single or multiple population oriented monitors must not exceed this concentration.
[i] State violation when exceeded more than eighteen times in any 12 consecutive months.
[j] The standard is based upon a calendar day (midnight to midnight).

Under the EPA approved State Implementation Plan, MDEQ is the primary air quality regulatory agency responsible for determining potential impacts from detailed development plans that exceed Montana Air Quality Permit (MAQP) thresholds. Emission levels from the exploration portion of the preferred alternative (Alternative D), as well as the exploration portion of Alternative A, Alternative B, and Alternative C, are below the 25 ton per year MAQP threshold, except for NO_X emissions from the drill rig stationary engine. However, ARM 17.8.744(1)(i) exempts drill rigs that have the potential to emit less than 100 tons per year and do not operate in the same location for more than 12 months from the need to obtain a MAQP. Therefore, a MAQP permit would not be required for the exploration activities of the proposed project. Several facilities that would be used to process and transport the CBNG have already received MAQPs from MDEQ. Based on information provided by Fidelity, for Deer Creek North five permitted field compressor station would be used to extract the gas and for Pond Creek four permitted field compressor station would be used to extract the gas. The field compressors that would be used for Fidelity's Deer Creek North POD are the Bitter Creek Pipelines, LLC (BCPL) Rancholme 21 Battery (MAQP #3334), BCPL Rancholme 14 Battery (MAQP #3383), Rancholme #2 Battery (MAQP #3388), Montana Royalty #3 Battery (MAQP #3386), and Decker #6 Battery (MAQP #3389). The field compressors that would be used for Fidelity's Pond Creek POD are the BCPL CX-35 (MAQP #3122), CX-24 (MAQP #3036), CX-14 (MAQP #3141), and CX-12 (MAQP #3387). In addition, an existing sales battery, BCPL Symons Central Compressor Station (MAQP #3250-00), would also be used for Fidelity's Deer Creek North and Pond Creek PODs. MDEQ previously determined that all of the field compressors and the sales battery require MAQPs. Emissions from the compressor sites will be analyzed for each alternative.

Incremental increases in the ambient concentration of criteria pollutants are regulated under the New Source Review - Prevention of Significant Deterioration (PSD) program. The program is designed to limit the incremental increase of specific air pollutants from major sources of air pollution above a legally defined baseline level, depending on the classification of a location. Incremental increases in PSD Class I areas are strictly limited, while increases allowed in Class II areas are less strict. The project area and surrounding areas are classified as PSD Class II. The closest PSD Class I area, the Northern Cheyenne Indian Reservation, lies northeast of the project.

The proposed project's potential to emit any regulated air pollutant is well below the PSD threshold of 250 tons per year for non-listed sources and the proposed project is not a listed source. Therefore, PSD does not apply to the proposed project. In addition, the PSD minor source baseline date has not been triggered for any regulated pollutant for the area that the proposed project would take place because there are no PSD sources that significantly impact the proposed project area. Therefore, a PSD increment consumption analysis is not required for the proposed project because the proposed project would not consume increment. Furthermore, ARM 17.8.807 exempts concentrations of oxides of sulfur (SO_X), particulate matter (TSP), or NO_X emitted from stationary sources attributable to the temporary increase in emissions from consuming increment if the time period for the temporary increase in emissions does not exceed 2 years, does not impact a Class I area or an area where an applicable increment is known to be violated, and does not contribute to a violation of the NAAQS.

Although the proposed project is not subject to PSD, the nine permitted field compressor sites, Fidelity's Deer Creek North POD are the BCPL Rancholme 21 Battery (MAQP #3334), Rancholme 14 Battery (MAQP #3383), Rancholme #2 Battery (MAQP #3388), Montana Royalty #3 Battery (MAQP #3386), and Decker #6 Battery (MAQP #3389). Fidelity's Pond Creek POD are the BCPL CX-35 (MAQP #3122), CX-24 (MAQP #3036), CX-14 (MAQP #3141), and CX-12 (MAQP #3387). and the existing sales battery, Symons Central Compressor Station (MAQP #3250) that would be used to process the gas from the proposed wells have applied for and received MAQPs from the MDEQ. MDEQ requests operators of all CBNG compressor stations to perform ambient air quality modeling to demonstrate compliance with the MAAQS/NAAQS. In addition, MDEQ requests that the modeling include a NO_X PSD increment analysis

to demonstrate compliance with the Class I NO_X increment and periodically the Class II NO_X increment, regardless of whether or not PSD applies to the facility. The ambient air quality modeling that was conducted for the permitted facilities that would be used to extract the CBNG from the proposed wells is summarized in Chapter 4 of this EA.

Refer to the Air Quality Technical Report for the Badger Hills POD environmental assessment for additional information.

3.1.1 Existing Visibility

Visibility values in Yellowstone National Park from 1992 through 2001 are displayed in Figures 3.2.4-1 through 3.2.4-3, Appendix 3, of the Badger Hills EA. Visual range on the 20% cleanest days varies from 140 to 168 miles. Average visual range varies from 93 to 125 miles. Visual range for the 20% haziest days varies from 59 to 78 miles. Trend analysis of Yellowstone visibility data reveals no significant trend of worsening visibility from 1992 through 2001.

Visibility monitoring has begun in North Absaroka Wilderness, Fort Peck Reservation and the Northern Cheyenne Reservation. Those data are not yet available.

3.1.2 Existing Atmospheric Deposition

3.1.2.1Wet Deposition

The precipitation pH in the Little Big Horn Battlefield National Monument near the Northern Cheyenne Reservation from 1987 through 2002 is displayed in Figure 3.2.5-1, Appendix 3 of the Badger Hills EA. The natural acidity of rainwater is considered to be represented by a range of pH values from 5.0 to 5.6 (Seinfeld, 1986). Mean annual pH near the Northern Cheyenne Reservation is generally within this range, although mean annual pH fell to 4.9 in 1998 and 1999. Precipitation pH values lower than 5.0 may be considered acidification and may cause adverse effects to plants and animals.

Figure 3.2.5-2, (Appendix 3, Badger Hills EA), shows mean annual sulfate concentrations in precipitation in the Little Big Horn Battlefield National Monument from 1984 through 2002. All values are below .8 mg/L.

Figure 3.2.5-3, (Appendix 3, Badger Hills EA), shows wet sulfate deposition in the National Monument. All values are below .4 kg/ha.

3.1.2.2 Dry Deposition

No dry deposition data is available for eastern Montana.

3.1.2.3 Total Deposition

Figure 3.1.5-4, (Appendix 3, Badger Hills EA), compares total sulfur deposition in Yellowstone National Park from 1992 through 1999 with the total sulfur deposition guidelines set for the Bridger Wilderness. Total sulfur deposition values are well below guidelines.

3.2 CULTURAL RESOURCES

3.2.1 Cultural Resources

BLM's 8100 Manual defines cultural resources as "a definite location of human activity, occupation, or use identifiable through field inventory (survey), historical documentation, or oral evidence. This includes archaeological, historic, or architectural sites, structures, or places with important public and scientific uses and may include definite locations (sites or places) of traditional cultural or religious importance to specified social and/or cultural groups. Additional guidance for conducting cultural resources is found in BLM Montana/Dakotas Cultural Resources Handbook H-8110-1: Guidelines for Identifying Cultural Resources (BLM 2002). More specific guidance for Coal Bed Natural Gas Projects is found in Appendix E: Cultural Resources in the 2003 Miles City Field Office POD Guidance Manual.

Areas for both the Deer Creek North and Pond Creek POD were block inventoried. That is the area around both the proposed wells and infrastructure was inventoried as a whole rather than only those portions containing the wells and associated developments. Large portions of both PODs had been inventoried for

the Decker Coal Mines and proposed CX and Wolf Mountain Coal mines in the 1970's and early 1980's. These reports were found to be inadequate to meet current BLM report standards and additional inventory was required. The inventory results and impacts are discussed by proposed POD below.

Deer Creek North: Ethnoscience, a cultural resources firm from Billings, Montana completed a Class III cultural resource block inventory of 8881.56 acres for the Deer Creek North POD in 2004 (Strait et al. 2005). Approximately 7298.1 acres are located within the Deer Creek North POD. Decker Mine owns 814.9 acres located within the Deer Creek North POD. These acres are already permitted for the mine. The only use within the permit area will be along an existing crowned and ditched road. BLM has not required inventory for crowned and ditched roads that will not be upgraded. The road is in Sections 7 and 8 of T. 9 S., R. 41 E. The sites are shown in relation to the proposed developments in Figure 6.1 (pages 6.2-6.5) of the inventory report. An additional 785.78 of fee surface/federal mineral acres and 153.59 acres of state surface/state minerals were examined to the north of the POD. The total area inventoried for the Deer Creek North POD project is 9,820.93 acres.

The main POD inventory identified 43 cultural resource properties within the project area (Table 3.2.1.1-attached by legal location). Twenty-four of the sites are prehistoric, 17 are historic and 2 sites contain both historic and prehistoric components. This total does not include five previously recorded prehistoric sites that were not found during the current inventory (i.e., 24BH1516, 24BH1555, 24BH1560, 24BH1561 and 24BH1562). Artifact collecting procedures by archaeologists (listed as total surface collection) at these five sites in the 1970s has likely removed all surface evidence of cultural material.

Ten of the sites with prehistoric components require additional investigation to ascertain if the site is National Register of Historic Places (NRHP) eligible under Criterion D (Table 3.2.1.1). Of the historic sites, 24BH3185 and 24BH3187 are recommended eligible to the National Register under Criterion C because they display especially well-preserved examples of vernacular architecture using dry-laid sandstone construction (Table 3.2.1.1). None of the other 31 prehistoric or historic sites are recommended for inclusion to the National Register of Historic Places. Table 3.2.1.1 in the Cultural Resource Appendix Lists the Sites by Number, Type, Eligibility and Impact.

Proposed developments will impact six sites: 24BH3171, 24BH3176, 24BH3187, 24BH3188, 24BH3193, and 24BH3196. Five of the sites (24BH3171, 24BH3176, 24BH3188, 24BH3193, and 24BH3196) are not eligible for listing on the NRHP. An underground power line will cross the non-contributing road portion of site 24BH3187, but will not impact the bridge, which is the only contributing element of the site.

Sites 24BH3171, 24BH3188 24BH3193, and 24BH3196 are historic homestead sites. A review of historic records associated with these sites shows that they did not meet any of the National Register Criteria. Site 24BH3176 is a lithic scatter consisting of 6 items (3 tools and 3 flakes) in a 3,360 sq. meter area. Given the low density of .002 (.00178) items per square meter, BLM felt that this location may not meet BLM's definition of 5 artifacts in an area of 50 feet in diameter as a site.

In addition to the cultural sites, 40 isolated finds were discovered (Table 6.1 in the cultural report). They include 36 loci with one to three chipped stone flakes, three loci with stone tools and one 1920s era farm implement. The isolated finds are not recommended as eligible for listing on the National Register of Historic Places. It should be noted that the Table 6.1 lists 48 isolates. Eight of the items called isolates were apparently later incorporated into boundaries of sites.

The two reports to the north of the POD boundary identified 10 cultural sites (Wagers and Fandrich 2004a, 2004b). One was recorded for the main POD report (24BH3192). The other nine sites consist of a lithic scatter (24BH3206) and a lithic scatter/stone circle (24BH3207) on state lands, a historic material scatter (24BH3201), a stone cairn and lithic scatter (24BH3202), historic graffiti (24BH3203), a historic cairn and lithic scatter (24BH3204), another historic cairn and lithic scatter (24BH3205), and two historic farmsteads (24BH3208 and 24BH3209) on fee lands. None of the sites would be impacted by proposed developments in the Deer Creek North POD. The setting of the sites would not change as development takes place in the POD. BLM agrees with the recommendations that Sites 24BH3201, 24BH3203, 24BH3208, and 24BH3209 are not eligible for the National Register and that eligibility is unresolved until the following

sites are tested, 24BH3202, 24BH3204, 24BH3205, 32BH3206, and 32BH3207. In addition to the sites, three isolates: a Besant point base, a brown chalcedony endscraper, and a red phosphoria chert flake were recorded on fee lands. None of the isolates are recommended as eligible for listing on the National Register.

An examination of the landscape identified no intentional patterns of spatial organization. Although homestead sites in the Deer Creek valley appear to be clustered along the valley, there is no evidence that the placement of these homesteads has intentional organization as a functional cluster. The settlers' response to the natural environment was to essentially use what was available and leave the land as they used it. Although some modifications to the environment were made for agriculture, these attempts largely failed and are not readily visible across the landscape. Cultural traditions played little or no role in the Deer Creek valley area. There is no evidence for a large ethnic influence in land use or architecture. None of the trails or roads within the POD are remarkable, and they would contribute little to a rural historic landscape. The Deer Creek valley reflects a natural landscape rather than a cultural one.

The water sources and vegetation in the area generally reflect that of a natural landscape, with little modification for pasture or agriculture. In addition to the drainages, two marginal groundwater sources are identified within Deer Creek North. These are not categorized as springs on the USGS maps. One was historically developed and has subsequently gone dry. It is located in the Decker Mine area. The other is an undeveloped seep that created a small boggy area. Although there are likely plants and animals within Deer Creek North that have medicinal, religious or economic value to Northern Plains tribes, there is no visible evidence that any specific area is recognized to be of particular importance to the tribes. No traditional cultural properties were identified within Deer Creek North.

Deer Creek North Conclusions: BLM determined that the Deer Creek North POD would have "No Adverse Effect" to historic properties. One eligible site (24BH3187) would be impacted by a buried underground powerline. However, the portion of the site that would be impacted (a portion of the road bed) is considered non-contributing to the eligibility of the site. An additional four historic homesteads sites and one prehistoric site would be impacted by infrastructure corridors. These sites are not eligible for listing on the National Register. Monitoring is recommended at two locations which have potential for buried cultural resources.

Pond Creek POD: Fidelity also contracted Ethnoscience to complete the necessary cultural resource investigations for the Pond Creek POD. Previous to Ethnocisence's investigation both of the previously drilled wells on Federal Minerals, 24D-2799 and 21MC-1199 Wells had been inventoried by BLM in 1994 and 1995. The 24D-2799 Well in the NE¼SE¼SW¼ of Section 27 T. 9 S., R. 39 E. was inventoried as part of the Energex 2 project (Birnie 1995). This inventory was negative in Section 27. The 21-1199 well in the Center NW¼ of Section 11was inventoried as part of the Energex 1 Project (Birnie 1994). BLM recorded four isolated lithics. The area was later found to be site 24BH3107, a substantial lithic scatter and stone circle site. This site was tested by Ethnoscience in 2004 and found to be eligible for listing on the National Register of Historic Places under Criterion D (see below). The remaining nine locations on fee surface/fee minerals had not been examined and one of the wells (21MC-0299) has impacted Site 24BH3103. This site, a small lithic scatter was tested and found not eligible for listing on National Register (see below).

Prior to fieldwork Ethnoscience examined a number of sources to identify the presence of previously documented sites/site leads. This included an examination of the Montana State Historic Preservation Office site files, the list of National Register of Historic Places (NRHP) sites in Big Horn County, Montana, the General Land Office (GLO) maps, published histories and ethnographic investigations for Big Horn County, Montana, and southeast Montana.

Ethnoscience then completed a Class III cultural resource inventory of 9,945.77 acres, of which 6,415.8 acres are located within the Pond Creek POD. Within the Pond Creek POD, 1,947.7 acres were not inventoried because no impacts are anticipated for those select areas (see Figure 6.1 in the BLM Report). Ethnoscience also inventoried 3,530 acres outside the Pond Creek POD. Of these, 751 acres are located within the Dry Creek POD and 2,779 acres are currently not within a Fidelity POD permit area, including

640 acres under Montana state jurisdiction.

The area that was inventoried includes 7,997.46 acres of private land, 1,308.31 acres that are administered by the Bureau of Land Management (BLM) and 640 acres that are owned by the state of Montana. The reports document the methods, activities and results of the cultural resource investigations conducted on private and BLM lands within the Pond Creek inventory.

The project area was surveyed utilizing a series of transects that were generally spaced 30 meters apart. An allowance for this spacing was made for areas where topographic conditions were severe. The ground surface visibility within the project area varied greatly, but averaged around 70 percent. In areas where ground surface visibility was poor, greater emphasis was placed upon examining cattle trails, two-tracks and erosional cuts/blowouts.

Sites are locations and physical remains that resulted from human activity. A prehistoric site is identified as any cultural feature (i.e., hearth, stone ring, etc.) or five artifacts within a 50 meter radius. A historic site is defined as any cultural feature (i.e., house, railroad, foundation, etc.) or five artifacts of three materials classes (i.e. ceramics, glass) within a 50 square meter area. Less than five or more dispersed artifacts were identified as "isolated finds". Sites and isolated finds were recorded on the BLM forms (Appendix B of the Inventory Report). The boundaries were generally established using GPS units.

The inventory identified 142 cultural resource properties. They include 122 prehistoric sites, 14 historic sites and 6 sites that contain both prehistoric and historic components. Five previously recorded sites (24BH2093, 24BH2100, 24BH2143, 24BH2148 and 24BH2152) were not found. The common practice of full surface collection could explain the absence of surface evidence for these sites during the current investigation. In some cases it was found that previously identified single sites should be merged into a single larger site. Table 3.2.2.1 lists the sites by number type, eligibility and impact for the project.

Ten of the sites are eligible for listing on the NRHP. Sites 24BH2091, 24BH2116, 24BH1042 and 24BH1961 are eligible under Criterion C. Sites 24BH2116, 24BH1961, 24BH3086, 24BH3087, 24BH3107, 24BH2113, 24BH1040 and 24BH1944 are eligible under Criterion D. One hundred two of the sites require additional investigation to ascertain if the site is NRHP eligible under Criterion D. The remaining sites are not eligible for inclusion to the NHRP.

In addition to the cultural sites, 62 isolated finds were discovered. The majority of the isolates are represented by one to four chipped stone flakes or cores. Ten of the isolates consist of chipped stone tools, including an Eden projectile point. The isolated finds are not recommended as eligible for listing on the NHRP.

In addition to the inventory, six sites were tested for this project. The sites include 24BH2154, 24BH2238, 24BH3092, 24BH3103, 24BH3107 and 24BH3109 for the Pond Creek Project. Testing consisted of one or more 1 x 1 meter units at each of the sites. Each of the test units was oriented to magnetic north. Units were hand excavated using shovels and trowels. Ten-centimeter arbitrary levels measured from the ground surface were utilized to maintain vertical control. At a minimum, units were terminated at bedrock or after two sterile levels. Sites 24BH1957 and 24BH1958 were tested as part of the Dry Creek POD project (Peterson and Strait 2004), but are included here since the Pond Creek POD overlaps with the Dry Creek POD.

The majority of the soil from the test units was screened through ¼ inch hardware mesh. The exception was an 11 percent sample taken from the southwest corner of each level that was screened through 1/8 inch mesh. All cultural materials were collected for analysis at the Ethnoscience lab facility in Billings, Montana. After excavation, one wall of each test unit was photographed and a profile map was drawn. Complete soil descriptions were made for each soil horizon. Afterward, the excavation units were backfilled.

Proposed developments will impact eleven sites. One of the sites are eligible for listing on the NRHP (24BH3107, 24BH3224). Seven of the sites (24BH1957, 24BH2238, 24BH3103, 24BH3109, 24BH3115,

24BH3224 and 24BH3225) are not eligible for listing on the NRHP. The NRHP eligibility for three of the sites (24BH1958/1959, 24 24BH2154/2243 and 24BH3092) is undetermined. Each of these sites has been tested to some extent. Monitoring will occur at these sites to ensure that significant deposits are not destroyed by construction. The project map shows impacts to sites 24BH3102, 24BH3220, 24BH1061, 24BH2131, 24BH2113, and 24BH3094. These sites will be avoided by 15-75 feet (see Attached Site and Impact Table). As will be noted below, monitoring is recommended for these sites to insure they are not impacted.

Impacted Eligible Sites: Site 24BH3107 is recommended as eligible under Criterion D. The site is a lithic scatter and single stone circle site. Four 1 X 1 meter test units were excavated at the site. Three of the units (2,3,4) did not yield buried material. Test Unit 1 in the ring contained approximately 381 pieces of debitage in surface and buried contexts. Debitage recovered from excavations at the site suggests it has potential to yield information about prehistoric lithic reduction strategies and stone tool manufacture. No development is planned near the stone feature and all other test units were negative. However, the possibility exists that buried components may be present outside the feature. As noted above, Fidelity plans to drill additional wells and connect the well to proposed infrastructure. Therefore, BLM is recommending monitoring of surface disturbing activities at the site.

Impacted Sites, Not Eligible for the National Register: Site 24BH1957 is a small lithic scatter that was tested as part of the Dry Creek POD Project. Excavations encountered bedrock at 9 cm below the surface and it was concluded the site did not have potential to contain buried materials (Peterson and Strait 2004). The site was impacted by a road and infrastructure corridor in the Dry Creek POD. This would also be used for access to portions of the Pond Creek POD.

Site 24BH2238 is also a lithic scatter. Approximately 100 flakes and 2 porcellanite biface fragments were observed on the surface. An existing two-track proposed for upgrading runs through the site. Two 1 X 1 meter units were excavated along the road to see if buried components would be impacted by the road. One test unit was negative and one yielded four pieces of debitage. The site was recommended as not eligible for listing on the National Register of Historic Places. BLM concurs with this recommendation and no additional work is recommended.

Site 24BH3103 is a small surface lithic scatter that has been impacted by an existing methane well. A Pelican Lake Point was observed as the only tool on the surface of the site. Three 1 X 1 meter units were excavated at the site - one near the well, one along the access, and one away from any disturbance. Only unit 2 yielded a single artifact within the first 10 cm, when bedrock was encountered. Bedrock was encountered at 10 and 30 cm below the surface in the other two test units, which did not contain cultural materials. The site is not eligible; testing indicates at best shallow deposits, the site lacks dateable artifacts in secure contexts, and is unlikely to answer pertinent research questions. No additional work is recommended at the site.

Site 24BH3109 is a sparse lithic scatter consisting of 150+ pieces of porcellanite debitage. An existing two-track proposed for use as a utility corridor runs through the site. Two 1 X 1 meter units were excavated along the road. Only test unit 2 yielded cultural materials and only from the first level. Although the report states that testing was not designed to evaluate National Register eligibility, we believe that the testing is adequate to demonstrate the site is unlikely to contain significant sub-surface deposits and contribute to answering pertinent archaeological questions. No additional work is recommend at the site.

Site 24BH3115 is a historic, unlined irrigation ditch. The ditch does not appear to be maintained has been eroded by Squirrel Creek, and has filled in some places. A review of historic documents shows that the ditch did not play a significant role in the development of agricultural of the area. The ditch would be impacted by a utility corridor in the NW¼ of Section 14, T. 9 S., R. 39 E. No additional work is recommended for this site. Although not eligible impacts are likely to be minimal (20-30 feet) to the 2 mile long site.

Site 24BH3224 is a historic ditch that was previously identified as part of the Powers Ranch landscape, which is eligible under Criterion A (See Peterson and Strait 2004 and the enclosed BLM report for further

discussion). The ditch would be impacted by a utility corridor in the SE¼SE¼Section 14, T. 9 S., R. 39 E. Subsequently it was found that the building making the Powers Ranch eligible had been removed in 1983. Since the site has been delisted, the ditch also would not be eligible as part of the landscape.

Site 24BH3225 is an unused, unlined, irrigation ditch labeled on the Pearl School USGS 7.5 Min. Quad as Power Cormack Ditch. The ditch in the inventory contains three laterals and three features. None of the laterals or features contains architecturally unique features and the ditch itself has eroded and has been filled in and no longer is used. The ditch does not play a significant role in the history of agricultural development in the area, does not appear to be associated with significant individuals, does not contain architecturally unique features, and does not posses the potential to yield further information to the history of the area. Impacts are utility corridors and an overhead powerline crossing the ditch in the SW¼ and NE¼ of Section 10, T. 9 S., R. 49 E. (Powerline), The NW¼ of Section 14, T. 9 S., R. 39 E., and SW¼ Section 13, T. 9 S., R. 39 E. (Utility Corridors). No additional Cultural Resources Work is recommended at these sites.

Impacted Sites, Where National Register is Not Resolved: Site 24BH1958/1959 is a lithic scatter and cairn site that was partially tested as part of the Dry Creek POD (Peterson and Strait 2004). Three 1 X 1 meter units were excavated in areas to be impacted by road construction for the Dry Creek POD. All of the tests were negative (Peterson and Strait 2004:16). This road will also be used for access to the Pond Creek POD. At the request of the Northern Cheyenne THPO, Gilbert Brady, the cairns were not tested. The portion of the site tested was recommended as not contributing since it did not contain cultural materials, dateable artifacts or features, or materials in secure contexts that would assist in addressing archaeological research questions. Since the cairns were not tested and portions of the site on the ridgetop above the road were not tested, eligibility cannot be resolved. No new disturbance would occur at the site as a result of the Pond Creek POD.

Site 24BH2154/24BH2243 consists of two previously reported sites in the same general location. The site is a lithic scatter and cairn site. The site consists of 600+ pieces of lithic debitage, a biface and one stone cairn. An existing two-track runs through the site. The company would like to use the road running through the site, possibly upgrading the road. Two 1 X 1 meter unit were excavated. Both show the site to be shallowly buried, encountering bedrock at 20 and 30cm below the surface and only yielding materials in the first 10 cm. The cairn feature was not excavated. Cairns may have cultural significance to Native American groups known to have used southeast Montana (Peterson and Deaver 2002). At an on-site meeting on April 8, 2005 with Fidelity, the BLM, and Conrad Fisher, Northern Cheyenne THPO it was decided not to test the cairn, but to monitor construction though the site.

Site 24BH3092 is a stone circle and lithic scatter on a high ridge overlooking Pearson Creek. The site consists of two stone circles and an extensive lithic scatter of 280+ pieces of debitage and a chalcedony biface. Fidelity has proposed constructing an access road that would impact the NW corner of the site. Ethnoscience excavated a single 1 X 1 meter unit where the road would cross the site. No cultural materials were encountered in the test unit. The southern and eastern portions of the site have the potential to contain buried cultural materials. The ridgeline with the reported large concentrations of lithics is on bedrock with at best shallow cultural deposits. Additional work is necessary to determine eligibility. The portion of the site that the road will pass through does not contribute to the eligibility of the site. We are recommending a temporary barrier be placed on the south side of the proposed road to prevent any impact to the untested portions of the site.

Based on the above observations, the proposed development plan has the potential to impact NRHP eligible sites and sites where eligibility is unresolved. To minimize the impacts to NRHP eligible sites, Fidelity proposes to monitor sites during construction or re-construct the original contours as is necessary.

Pond Creek POD Conclusions: BLM has determined that the Pond Creek POD will have "No Adverse Effect to Historic Properties". Testing results show that portions of sites that will be directly impacted by proposed development do not contain significant buried cultural deposits. However, other areas of the site may contain buried deposits away from development. Therefore, BLM is recommending construction monitoring of sites that will be impacted by the project. This is to ensure significant buried cultural

deposits will not be impacted. Monitoring would be done by archaeological and Tribal monitors. Should buried cultural deposits be encountered work in the vicinity of the find would cease until it could be evaluated, and if necessary, mitigated.

3.2.2 Traditional Cultural Values

An ethnographic overview of Southeast Montana (Peterson and Deaver 2002) includes the region containing the POD project area. The study identified water and a number of site types as culturally sensitive and also urge avoidance of all sites where possible. The Northern Cheyenne Tribal Document (NCT 2002) and Crow Tribal Document (CTI 2002) also identified a number of site types as being culturally sensitive to the tribe. These include large stone ring sites, isolated fasting beds, rock art sites and large diameter fasting structures such as medicine wheels. Although the area may contain these features of concern, such as burials, which may be marked by cairns, communal kills sites, eagle trapping pits, fasting beds, stone rings, petroglyphs or rock art, vision quest sites and environmental locations where plants, water or mineral are gathered, the ethnographic study did not identify an ethnographic landscapes. One site within the Deer Creek North POD was listed in the Ethnographic Overview as being of potential concern to Native American groups. The site is described initially as a possible collapsed vision quest structure. However, when the site was re-recorded for the Deer Creek North project, the site was found to stacked, rather than collapsed. Stacked piles of stone are more indicative of historic use than prehistoric use. The site is away from any development and would not be impacted by it.

3.2.3 Native American Consultation

Letters discussing the project were sent to Native American Tribes in Montana, Wyoming, and North and South Dakota on February 9 and 15, 2005. No responses were received from the tribes. An on-site visit of the Deer Creek North POD was made with Conrad Fisher, Northern Cheyenne Tribal Historic Preservation Officer (THPO) and James Walks Along of the Northern Cheyenne Tribe on April 1, 2005. A tour through the area and to specific locations did not raise any concerns from the Northern Cheyenne THPO. The tribe also communicated to the BLM that they thought there would be no adverse impact to cultural resources from the project, although they did say they would like to reserve their opinion in case of an inadvertent discovery made during construction. Should this occur, stipulations attached to the Federal APD's and rights-of-way would occur and work in the vicinity of the find would halt until the find could be evaluated, including Native American consultation. The Northern Cheyenne THPO also toured the Pond Creek POD on April 8, 2005. The general impressions were the same as those for the Deer Creek North POD. The tribe would also be invited to participate in the construction monitoring proposed for the project.

3.2.4 Paleontological Resources

Paleontological Resources are defined as fragile and nonrenewable scientific record of the history of life on earth (BLM, 1998). Fossils of the Cenozoic's Paleocene epoch (54 to 65 million years ago) have been found in the Fort Union Formation throughout Wyoming and Montana, but no important localities have been identified in the project area. Vertebrate fossil remains are particularly nonexistent in the Tongue River Member of the Fort Union Formation, which is the upper most formation within the POD project area. Paleobotanical fossils have been recovered from the Tongue River Member, but not within the project area. Past studies of paleontological resources at the Spring Creek and proposed CX Decker Mines have shown that the POD area has a low potential to yield significant vertebrate fossil remains. Fossils located in the Spring Creek Mine area include plant, amphibian, reptile and invertebrates (NERCO, 1977). A paleontoloogical review of the CX Decker area did not locate any significant vertebrate fossil localites (Hager 1980). The POD area occurs in similar geologic formations as the Spring Creek Mine and similar paleontological resources may occur. Protection of fossil resources on public lands extends to vertebrate fossils or specially designated areas. No areas designated for special management for paleontological resources are located near the project area in Montana. Although invertebrate fossils are not usually considered significant and permitable paleontological resources (the need to obtain a permit to collect), they do have cultural values to Native American groups and require consideration under laws and executive orders that deal with access and maintenance of religious sites and resources on public lands (Peterson and Deaver, 2002). Fossils on split estate lands are considered part of the surface estate and belong to the surface owner (BLM, 1998). Unanticipated discoveries of paleontological resources during project activities will be dealt with through implementation of measures in the approved federal permit that require

notification of BLM's authorized officer in the event of important discoveries and suspension of construction activity to prevent loss of significant paleontological values.

3.3 GEOLOGY AND MINERALS

3.3.1 Geology

The project area lies in the Montana portion of the Powder River Basin. The Powder River Basin is an asymmetrical sedimentary basin; its structural axis is located closer to the west flank of the basin than the east side. The project area is also near the basin axis with the rock strata dipping gently to the south, southwest about 1º to 2º although localized structures, such as faulting and folding can cause steeper dips or changes in dip direction.

Numerous faults occur in the area in a fault zone just north of the Montana-Wyoming state line. These faults trend from southwest to northeast, are typically down dropped to the south and may have displacements of up to 150 feet as in the Spring Creek and Carbone faults located at the Spring Creek Coal Mine. At least two faults may be located in the Pond Creek project area and one in the Deer Creek North project area and several others are located both north and south of the project areas. Technical data on these faults is currently unavailable.

Outcropping bedrock in the area consists of the Tertiary-age Wasatch and Fort Union Formations. The Wasatch Formation is the predominant surface formation present in the Pond Creek project area and also is present, but to a lesser extent, in the Deer Creek North project area. It unconformably overlies the Fort Union Formation. The Wasatch can be as much as 600 feet thick, and is made up of yellowish to light gray siltstone, massive to cross-bedded sandstones, brown carbonaceous shales, coal seams and red clinker. A brown layer of gastropod shells (coquina) about 6 to 8 inches thick is found about 200 feet above the base of the Wasatch in many areas (Vuke, 2001).

The Fort Union Formation is locally broken into three members (from youngest to oldest): Tongue River, Lebo and Tullock. The oldest member, Tullock, is composed of light-colored sandstone, sandy shale, carbonaceous shale, clay and locally thin, non-continuous coal beds. The middle Lebo Member consists of dark shale, mudstone, carbonaceous shale, siltstone, argillaceous sandstone, and coal. The Tongue River Member contains mineable coal units within the Fort Union Formation and consists of sandstone, interbedded siltstone, shale and thick coal beds. Local depositional environments of the coal seams resulted in formation of several distinct coal beds within the Tongue River Member.

The Tongue River Member of the Fort Union Formation was deposited in a low-lying coastal or near-coastal area, mainly as fluvial and over-bank mud, and back-swamp peat. This depositional setting formed rock types that change markedly over short distances, making it difficult to characterize the nature of overburden or inter-burden intervals.

Where sufficient thickness of coal was deposited and conditions were right to allow for ignition, the coal burned. The resulting heat baked and fused the overlying material into a brittle resistant reddish rock, locally called "clinker" or "scoria" deposits (Cole, 1980).

Following coal deposition, the general area was faulted, resulting in displacement of coal seams. Faults in the area are generally oriented northwest and northeast (USDI, 2000).

The Fort Union Formation is underlain by Cretaceous-age Hell Creek Formation, which is not exposed in the area.

The target coal seams are the Dietz 1, Dietz 2, Dietz 3, Carney, and Monarch and are present from approximately 200 feet to 1,100 feet. There are 126 federal, and 122 private wells are planned for development of these 5 coal seams, in the Deer Creek North and Pond Creek PODs.

3.3.2 Coal Bed Natural Gas

Coal Bed Natural Gas is held in the coal beds by hydrostatic pressure within the coal. A drawdown of the pressure as the result of pumping water from the coal bed causes the gas to move to the lower pressure in the well bore.

3.3.3 Methane Migration

The objective in pumping the water from the CBNG wells is to reduce the pressure and cause the gas to desorb from the coal matrix and migrate to the CBNG well. In reservoir dynamics, as in hydrology, the flow will be from areas of high pressure to areas of lower pressure. For this reason, the gas will flow towards wells pumping water from the coals seam and reducing the pressure enough to cause the gas to be desorbed. Complete dewatering of the coal is not desired since this would require excessive pumping of water due to the advent of unconfined conditions. Also, dewatering would cause the cleat (fractures) within the coal to close up and inhibit the flow of methane to the well.

The cumulative effect is more complicated. The pumping of CBNG wells would cause the areas near the wells to desorb the gas and have the gas flow towards them; however, a reduction in hydrostatic head (pressure) would extend beyond that area over which the gas is desorbed in what is called a "cone of depression". For this reason, water wells that are completed in a CBNG producing coal seam(s) could produce gas from these wells at pumping rates that are less than those that would have been required in the past. The water wells would be causing a localized "cone of depression" around the well, which would cause the gas to desorb, and; therefore, the gas flows towards them. This desorption of gas is caused by lower pumping rates than would have been required prior to CBNG production. The cumulative effect of gas migration is also affected by the local geology of the coal, gas content of the coal and faulting in the area.

Any monitoring wells completed in a CBNG producing coal bed may also experience the desorption of gas as a result of the reduction of the hydrostatic pressure. This may cause the monitoring well to become ineffective for monitoring drawdown in the coal bed.

The BLM has determined that the potential for methane migration and the potential impacts from the Deer Creek North Project and the Pond Creek Project are similar to the impacts described in the WY FEIS and Proposed Amendment for the Powder River Basin Oil and Gas Project and the MT FEIS. These could include migration of methane gas to water wells, monitoring wells, or to the surface.

Deer Creek North Project

Methane migration to water wells, springs or monitoring wells: Based on the water draw down analysis for the project, the 20 foot drawdown for the Deer Creek North POD would extend approximately 1.6 miles from the exterior boundary of the POD. The ongoing CBNG production and the 30 years of coal mining in the area have drawn down the hydrostatic pressure within the producing area (see Section 3.4.2) especially in the coal beds mined at East Decker (the Anderson coal bed, Deitz 1 coal bed and Deitz 2 coal bed). A drawdown of 20 feet would be equivalent to a pressure reduction of about 8.7 psi in each coal. The gas in the coal requires a pressure reduction of approximately 10 to 40 percent before desorption begins.

The hydrostatic pressure in the Dietz 1, 2 and 3 coals are estimated to be 70 psi to 364 psi. To enable gas to desorb from this coal would require a pressure reduction of a minimum of 7 psi. This is equivalent to a water drawdown of at least 15 feet. The East Decker mine has mined the shallowest Dietz coals, therefore, it is likely that this pressure has been reached already and any wells/springs in the Dietz 1 and 2 coal beds may already be affected by gas desorption.

In the Monarch coal, the formation pressure is estimated to be from 112 psi to 443 psi. This coal would require a minimum of 11 psi reduction of pressure before gas would begin to desorb. This is equivalent to a water drawdown of 25 feet.

In the Carney coal, the formation pressure is estimated to be from 171 psi to 464 psi. This coal would require a minimum of 17 psi reduction of pressure before gas would begin to desorb. This is equivalent to a water drawdown of 39 feet.

Based on the Hydrology section (3.4.2), there are monitoring wells, water wells or springs within this area that may be affected by methane migration. According to MBMG's GWIC database and the USGS's NHD dataset, there are 30 domestic or public water supply wells, 33 stock wells, 13 industrial or irrigation wells, 10 wells for which the use is not known, 372 monitoring or research wells, 21 unused wells, and 7 springs within the 20' drawdown contour of the project area. The wells or springs would have to be completed or producing from a coal bed and within the area where the hydrostatic pressure has been reduced in the particular coal bed below that required to begin desorption. The minimum drawdown pressure and depth to initiate gas desorption is shown above for each coal.

The operator has certified that water mitigation agreements have been reached with all potentially affected owners of wells and springs in accordance with the requirements of MBOGC Order No. 99-99. This Order requires that operators offer water mitigation agreements to owners of water wells or natural springs within one mile of a CBNG field, or within the area that the operator reasonably believes may be impacted by CBNG production, whichever is greater, and to extend this area one-half mile beyond any well adversely affected. This order applies to all wells and springs, not just those which derive their water from the developed coal seams. This Order requires "…prompt supplementation or replacement of water from any natural spring or water well adversely affected by the CBM project…" These agreements would apply to those wells which experience an impact to their use whether it is due to decreased yields, the migration of methane, or a change in water quality.

Drainage of Indian Mineral resources: The nearest Crow Indian minerals are located more than 11 miles to the west and the Northern Cheyenne Reservation is approximately twenty miles north of the POD project area. The Northern Cheyenne has isolated parcels of land which are approximately 2 miles away (N½SW¼, Section 26, T. 8 S., R. 40 E.).

Methane migration to conventional wells in the area: There is one abandoned CBNG well within the project area, a well in the SW¼NE¼ of Section 9 of T. 9 S., R. 41 E. The nearest plugged conventional well outside the POD area is located in the NE¼NE¼ of Section 36, T. 8 S., R. 41 E. All the plugged wells that are in or near this POD area are listed below.

Table 3.3.3-1: Deer Creek North Conventional Oil & Gas Wells

Well	Location	Total Depth
D-6	NWNE 19-T9S-R41E	8,850 feet
1	NE SE 25-T9S-R42E	5,653 feet
41X-12	NE NE 12-T9S-R42E	8,010 feet
Plugged CBNG Wells		
41EC-3091	NE NE 30-T9S-R41E	1,222 feet
1	SWNE 9-T9S-R41E	795 feet

Drainage of Federal Mineral resources: Federal minerals are adjacent to each side of the exterior boundary of the proposed POD area. Due to this situation, there may be drainage situations identified as the wells in the POD begin producing. These situations will be handled on a case by case basis.

Pond Creek Project

Methane migration to water wells, springs or monitoring wells: Based on the water drawdown analysis for the project, the 20 foot drawdown for the Pond Creek POD would extend approximately 1.6 miles from the exterior boundary of the POD. The ongoing CBNG production and the 30 years of coal mining in the area have drawn down the hydrostatic pressure within the producing area (see Section 3.4.2) especially in the coal bed mined at West Decker. A drawdown of 20 feet would be equivalent to a pressure reduction of about 8.7 psi in each coal. The gas in the coal requires 10 to 40 percent in pressure reduction before desorption begins There are only three Dietz coal bed wells that are within the Pond Creek POD area and although there is no mention of which Dietz bed there are going to produce from because of the depth of the wells it is assumed they will be from the lowest Dietz coal bed. The hydrostatic pressure in the Dietz is estimated to be 226 psi to 291 psi. To enable gas to desorb from this coal would require a pressure

reduction of at least 22.6 psi. This would be equivalent to a water drawdown of at least 52 feet in the Dietz 3 coal bed.

The West Decker mine has mined the shallower Dietz coals, therefore, it is likely that the minimum hydrostatic pressure to begin desorption has been reached near the mine boundary (within 1 to 2 miles) in the Dietz 1 and 2 coal beds and any wells/springs in the Dietz 1 and 2 coal beds may already be affected. There has been information submitted concerning a well venting gas within the Decker Mine monitoring well network; in the SW¼SW¼ Section 7 of T. 9 S. R. 39 E. A check of the GWIC records indicate there are 2 wells located there, one of which was probably completed in the Dietz 1 bed (259-274 feet) and the other completed in the Dietz 2 bed (446-462 feet). Either one or both of these wells may be venting gas based on their distance from the mine permit boundary (1/2 mile).

In the Monarch coal, the formation pressure is estimated to be from 129 psi to 332 psi. This coal would require at least a 12.9 psi reduction of hydrostatic pressure before gas would begin to desorb. This is equivalent to a water drawdown of about 30 feet.

In the Carney coal, the formation pressure is estimated to be from 194 psi to 405 psi. This coal would require at least a 19.4 psi reduction of hydrostatic pressure before gas would begin to desorb. This is equivalent to a water drawdown of about 45 feet.

Based on the Hydrology Section (3.4.2), there are monitoring wells, water wells or springs within this area that may be affected by methane migration. The wells or springs would have to be completed or producing from a coal bed and within the area where the hydrostatic pressure has been reduced in the particular coal bed below that required to begin desorption. The minimum drawdown pressure and depth to initiate gas desorption is shown above for each coal bed.

The operator has certified that water mitigation agreements have been reached with all potentially affected owners of wells and springs in accordance with the requirements of MBOGC Order No. 99-99. This Order requires that operators offer water mitigation agreements to owners of water wells or natural springs within one mile of a CBNG field, or within the area that the operator reasonably believes may be impacted by CBNG production, whichever is greater, and to extend this area one-half mile beyond any well adversely affected. This order applies to all wells and springs, not just those which derive their water from the developed coal seams. This Order requires "…prompt supplementation or replacement of water from any natural spring or water well adversely affected by the CBM project…" These agreements would apply to those wells which experience an impact to their use whether it is due to decreased yields, the migration of methane, or a change in water quality.

Drainage of Indian Mineral resources: The nearest Crow Indian minerals are located more than 2 miles to the west and the Northern Cheyenne Reservation is approximately twenty miles north of the POD project area. The Northern Cheyenne has isolated parcels of land which are approximately 2 miles away (N½SE¼, Section 27, T. 8 S., R. 40 E).

Methane migration to conventional wells in the area: There is one abandoned conventional oil well within the project area, a well in Section 27 of T. 9 S., R. 39 E and 1 plugged CBNG well located in the NW¼NE¼ of Section 1, T. 9S., R.39E.. All the plugged wells that are in or near this POD area are listed below. The wells in Sections 16 and 17 are inside the Decker Mine boundary and have had the surface casing removed and been re-plugged below the level of mining operations. They should not provide a conduit for methane migration to the surface.

Table 3.3.3-2: Pond Creek Conventional Oil & Gas Wells

Well	Location	Total Depth
1	NENE 17-T9S-R40E	8334 feet
1	SESE 16-T9S-R40E	3485 feet
1	NWNW 24T9S-R39E	5508 feet
1	NE SW 16-T9S-R39E	6034 feet
20-1	SESE 20-T9S-R40E	5803 feet
1-17	SWNE 17-T9S-R39E	5980 feet
1	SESE 36-T9S-R39E	2310 feet
1	SW NE 33-T8S-R39E	5609 feet
1	SENE 34-T8S-R39E	5030 feet
1	NE NW 35-T8S-R39E	8205 feet
Plugged CBNG wells		
31EW-199	NWNE 1-T9S-R39E	740 feet
41W-3190	NE NE 31-T9S-R40E	700 feet

Drainage of Federal Mineral resources: Federal minerals are adjacent to the north, west and east of the proposed POD area. Due to this situation, there may be drainage situations identified as the wells in the POD begin producing. These situations will be handled on a case by case basis.

3.4 HYDROLOGY

3.4.1 Surface Water

CBNG produced water would be transported through buried plastic flowlines from each well site to the following water management options: (1) beneficially used for industrial uses (dust suppression) in the Spring Creek and Decker Coal Mines; (2) beneficially used by Fidelity for CBNG drilling, construction, and dust suppression; (3) beneficially used by livestock and wildlife; (4) discharged to the Tongue River using Fidelity's existing MDEQ direct discharge permit (MT0030457), including modifications; (5) treated via ion exchange and discharged to the Tongue River using Fidelity's proposed MDEQ discharge permit for treated water (MT0030724); (6) stored in the existing off drainage impoundment 23-0299; (7) stored in the lined off drainage impoundment 44-3490, which was authorized in the Badger Hills POD, but has not yet been constructed; (8) stored in proposed lined off drainage impoundments 23-2191, 33-2191 and 31-2991; and (9) during the irrigation season, applied to 114 acres of managed irrigation, which was authorized in the Badger Hills POD, but is not in use at this time.

The beneficial use of this water by the Spring Creek mine, Decker mine, Fidelity, and for stock and livestock water is not anticipated to result in noticeable impacts, since these uses will be dispersed such that saturated flow to groundwater will not occur, and these uses will not result in discharges to surface waters. As such, these beneficial uses will not be analyzed in detail. Fidelity has obtained an interim permit to appropriate water from the Montana Department of Natural Resource Conservation (DNRC) for this project which allows the produced water to be used beneficially.

Off drainage impoundment 23-0299 is an existing impoundment on fee surface/fee minerals which has been approved by Montana Board of Oil and Gas Conservation (MBOGC). This impoundment was approved to receive water from Federal Wells under the Dry Creek POD. This impoundment is used for livestock watering. It is not anticipated that water will infiltrate through the base of this reservoir due to the base being composed of clay and the CBNG water having a high sodium adsorption ratio (SAR). When high SAR water is placed in an impoundment whose bottom and sides are rich in clay, the clay deflocculates and causes the impoundment to seal (Bobst and Wheaton, 2004). It is believed that this high SAR water has long since caused the base of the impoundment to seal and it is therefore considered to effectively be a total containment basin, with evaporation being the only route by which water can leave the impoundment. This impoundment does not have the potential to create noticeable impacts to ground waters, or surface waters. Since this impoundment is located off drainage near the ridge line, it will not intercept an appreciable volume of runoff, and therefore, will not impact downstream water rights or uses.

Upon pit closure, the soils beneath this impoundment will be tested to determine if any salts have evapo-concentrated to hazardous levels, and the soils will be disposed of in accordance with all applicable federal, state, and local laws. Fidelity will also be required to monitor this impoundment under the Groundwater Monitoring Plan, which is included in each of the MPDES permits for this project. As such, this existing impoundment does not have the potential to create noticeable impacts to hydrologic resources, and will not be analyzed in detail.

Lined off drainage impoundment 44-3490 was analyzed and approved along with the Badger Hills POD (BLM, 2004). The analysis in the Badger Hills EA concluded that with the applied conditions of approval (COAs) imposed under the Badger Hills EA this impoundment would not result in noticeable impacts to hydrologic resources. These COAs require Fidelity to monitor and adjust management practices if needed. Fidelity will also be required to monitor this impoundment under the Groundwater Monitoring Plan, which is included in each of the MPDES permits for this project. As such, this impoundment does not have the potential to create noticeable impacts to hydrologic resources, and will not be analyzed in detail.

The irrigation areas proposed for use with these PODs were previously analyzed in the Bader Hills POD EA. The analysis in the Badger Hills EA concluded that with the applied COAs the use of these managed irrigation areas would not result in noticeable impacts to hydrologic resources. These COAs require Fidelity to monitor the depth of soil saturation (which controls the depth that salts reach), and to monitor soil conditions and adjust management practices, if needed. These irrigation areas would be monitored during irrigation periods to ensure that direct flow to surface waters did not occur. As such, these irrigation areas would not have the potential to create noticeable impacts to hydrologic resources, and they will not be analyzed in detail in this EA.

The ion exchange water treatment process would cause a concentrated low pH Na-Cl type brine solution to be generated (~1% of the feed volume). This brine would be either transported via licensed waste hauler and disposed of at a permitted Class 1 injection well in Wyoming, or further concentrated on site, crystallized to a solid, and either closed in place on-site or transported and disposed of at a permitted non-hazardous waste landfill. Fidelity has identified Kissack Water and Oil Services, Inc. as a potential contractor for brine disposal. Kissack's Kuehne injection well is operated under UIC permit #01-109, and Kissack's Hamm #1 injection well is operated under UIC permit #01-036. Both of these wells are permitted as Class I injection wells. As such, it is not anticipated that the management of this brine has the potential to create noticeable impacts, and will not be analyzed in detail.

All of the proposed well sites are located in the Upper Tongue River 4th Order Watershed. Deer Creek flows through the Deer Creek North POD area. Pearson Creek, Pond Creek, Squirrel Creek and Dry Creek flow through the Pond Creek POD area. Squirrel Creek is considered to be a perennial stream, while the others are ephemeral to intermittent in nature, with some perennial pools. All of these creeks are tributaries of the Tongue River. The Tongue River is considered high quality water pursuant to Montana's Non-degradation Policy and degradation of high quality water is not allowed unless authorized by the Department under 75-5-303(3), MCA. The total maximum daily load (TMDL) analysis process for the Tongue River watershed is currently underway.

This analysis will focus on the Tongue River since this is the only waterway that would receive CBNG water discharges. The ephemeral to intermittent drainages were not analyzed in detail since they are not considered to be impaired and would not receive any CBNG produced water. Therefore there would not be a noticeable effect to these streams and they would remain unimpaired.

The entire length of the Tongue River below the Tongue River Dam is affected by the presence of the Tongue River Dam. The presence of this dam causes sediment to be trapped behind the dam, and causes the magnitude of peak flows to be reduced, thereby altering the riparian environment (Collier, et al., 1996). The flow along the reach below Pumpkin Creek is also substantially reduced during the irrigation season by the diversion of water at the 12 Mile Dam into the TY irrigation ditch. During low flows, the majority of the water in the Tongue River is diverted at this point, and any measurements taken below this point are more representative of Pumpkin Creek and other minor tributaries than they are of the Tongue River.

The Tongue River in the areas of the proposed discharges (upstream from the Tongue River Reservoir) was listed as impaired for aquatic life support, and cold-water fishery for trout in the MDEQ's 1996 303(d) list for impaired streams. The probable cause was listed as flow alteration. The probable sources were identified as being agriculture, flow regulation and/or modification and irrigated crop production. Thus, this reach of the Tongue River was listed due to a lack of flow. The Tongue River in the areas of proposed discharges was not listed as impaired on the 2000, 2002 and 2004 303(d) lists based upon a reassessment of water quality.

The portion of the Tongue River from the diversion dam just above Pumpkin Creek (12 Mile Dam for the TY irrigation ditch) to the mouth is currently listed on the 303(d) list, and has been listed since 1996. This portion of the Tongue River is located approximately 100 miles N/NE from the project area (~142 river miles downstream). The MDEQ has identified flow alteration as the probable cause of the impairment, and dam construction and flow regulation/modification as the probable sources of impairment along this downstream reach. Thus, this reach was listed due to a lack of flow.

Fidelity's CBNG discharge to the Tongue River is currently occurring at a rate of approximately 820 gallons per minute (gpm) upstream of the Tongue River Reservoir (Pond Creek POD WMP). This discharge is permitted for up to 1,600 gpm of untreated CBNG discharge, and this discharge has been occurring since September 1999. The quality of this untreated discharge has an electrical conductivity (EC) of approximately 2101 μS/cm and an SAR of approximately 54, which is typical for waters produced in conjunction with CBNG (VanVoast, 2003). This permit is under revision at this time in order to comply with the requirement for EC and SAR permits to be flow based. Two other CBNG permits have been submitted to the MDEQ for the Tongue River; the recently approved permit for the Powder River Gas (PRG) project (MT0030660), and the pending Fidelity application (MT0030724). These are both for treated discharges with EC<1000 and SAR<3. The Fidelity treated discharge is proposed to be located upstream of the Tongue River Reservoir. The Powder River Gas discharge is located below the Tongue River Dam, and has recently begun discharging at a rate of approximately 350 gpm.

Within Wyoming, two permits were issued in 1999 which allow for direct discharge of untreated CBNG water to the Tongue River. These 1999 permits included 14 discharge points totaling approximately 0.3 cubic feet per second (cfs; 135 gpm) to Goose Creek, and 3 discharge points totaling approximately 0.2 cfs (90 gpm) to the Tongue River. More recently, the "Brickerhoaf" permits were issued in the Prairie Dog Creek watershed for discharge of untreated water into impoundments. A permit for the discharge of up to 600 gpm of CBNG water with an SAR<3 and EC<1000 μS/cm into Prairie Dog Creek has also been approved (Bobst, 2005). A summary of all permitted CBNG discharges to the Tongue River is found on Table 3.4.1-1. All of these permitted discharges account for a potential maximum of 8,897 gpm (19.8 cfs) of CBNG water discharged in the Tongue River watershed during the spring. This volume represents 6.5% of the historical LMM flow at the state line station (see table 3.4.1-2).

Table 3.4.1-1: Existing and Proposed CBNG Discharge Permits in the Tongue River Watershed

Permit	Permit Status	Potential Discharge Volume (gpm)	Treated (Y/N)
MT0030457	Approved - Revision in Draft	Winter-2500	N
		Spring-5250	
		Summer-1600	
MT0030660	Approved	1,122	Y
MT0030724	Draft	1,700	Y
WY-Direct 1	Approved	90	N
WY-Direct 2	Approved	135	N
WY-Treated	Approved	600	Y
WY-	Approved	N/A	N

Impoundment			

This project would not contribute to the impairment of any 303(d) listed streams. There are several reasons for this, including (1) the proposed discharge is small relative to the river at the point of discharge (1,600 gpm + 1,700 gpm = 3,300 gpm = 7.3 cfs = 4.1% of flow at LMM), (2) flows below the dam are controlled by reservoir releases, and (3) 142 miles of tributary inputs and irrigation removals (especially the 12 Mile Dam). Thus, flows in the lower listed reach are a function of agricultural demands and not natural flows or CBNG inputs in the upper basin.

EC and SAR are primary constituents of concern with CBNG discharges (MDEQ, 2003); therefore, the discussion in this document will focus on these parameters. Prior to the issuance of MPDES permits analysis of all constituents for which surface water quality criteria have been developed are conducted. These analyses are included in the MDEQ's supporting documents (Statement of Basis for the Treatment permit and Fact Sheet for the renewal of the existing permit). Increases in sediment delivery are a potential concern from the disturbances which would result from CBNG activities; however, as outlined in the soils analysis, it is not anticipated a noticeable volume of sediment would reach surface waters. As such, impacts from sediment will not be analyzed in the hydrology portion of this analysis.

EC is the ease with which electric current will pass through a water sample, and it is proportional to the salinity of the sample. The units used for the EC of a water sample are microSeamens per centimeter (uS/cm). SAR is a complex ratio of sodium to calcium and magnesium, and is an important parameter for determining the utility of water for irrigation due to the potential impacts of sodium on clay rich soils. Since SAR is a ratio, it is unitless. EC and SAR are the primary factors that determine the usability of water for irrigation, and irrigation is the use that has been determined to be most sensitive to CBNG inputs (MDEQ, 2003).

A USGS Gaging Station is located on the Tongue River between the state line and the reservoir (Tongue River at State Line), and data from this station should be representative of the reach of the Tongue River in Montana above the reservoir. A USGS Gaging Station is located immediately downstream of the reservoir (Tongue River below Dam), and data from this station should be representative of the mixing effects within the reservoir. A USGS Gaging Station is located at the Birney Day School Bridge (Tongue River at Birney Day School), and data from this station should be representative of this reach of the Tongue River, and provide for comparison to the Northern Cheyenne Surface Water Quality Criteria.

Since the dataset required to determine existing water quality is not sufficiently robust, it is necessary to conduct modeling to depict the existing conditions. Comparisons between monitoring data modeled historical data (Pre-September 1999; Pre-CBNG) and modeled existing data are shown in the Hydrology Appendix. Upstream of the reservoir, the modeled results are based upon simple mixing with historical water samples collected between May, 1994 and September, 1995. This time period was chosen because of the relative abundance of data, which was available for this time period. Resultant SAR values are calculated from the resultant Na, Ca, and Mg values. The resultant SAR and EC values are then graphed vs. flow, and used to extrapolate water quality values at the flows in question (low mean monthly flow (LMM), high mean monthly flow (HMM), and 7Q10 flow (a statistical value indicating the lowest flow that would be anticipated to occur for seven consecutive days over any 10 year period)). The resultant extrapolated values are adjusted by a constant correction factor to adjust for the difference between the historical record for this site up to September, 1999, and the shorter data set used for this analysis. These constant values were determined by comparing the extrapolated values from the model with no CBNG inputs to extrapolated data using Pre-September, 1999 data. All CBNG discharges above the reservoir were added at this station and mixed.

Below the dam, the resultant water quality data are based upon the inputs from upstream of the reservoir from May, 1994 to September, 1995 being mixed with the coal mine discharges into the reservoir during this time, and complete mixing in the reservoir. The effect of the reservoir is to moderate the variability of water quality (i.e. the water quality at the State Line station above the reservoir is more variable than the water quality at the station below the Tongue River Dam). This approach is supported by the historical record of water quality above and below the reservoir. This approach does not take into account

evaporation, infiltration, or chemical reactions in the reservoir. The treated CBNG discharge from PRG is added to the results from this mixing at the station below the dam. A constant correction factor which was determined from the difference between the extrapolated values from Pre-September, 1999 data, and the results from using the shorter data set for this analysis was also applied to these results.

The water quality at Birney Day School was determined by adding the historical increase in EC and SAR, at the flows in question, between the station below the Dam and the station at Birney Day School to the results from below the Dam. This constant correction factor also serves to adjust for the difference between the extrapolated values from the Pre-September, 1999 data at this site to the results from the shorter data set used in this analysis.

The Montana Board of Environmental Quality has determined that permitting of untreated discharges in relation to EC and SAR should be flow based. Therefore, the permit revision for MT0030457 needs to be flow based. MDEQ has determined that the most reasonable way to conduct the flow based analysis is by separating the water year into three segments (Winter-November to February; Spring-March-June; and Summer-July-October), and conducting independent statistical analysis for each of these segments. Through this approach a 7Q10 is determined for each segment of the year, and allowable discharge is calculated using these values. Under the MDEQ's Draft permit for MT0030457 2,500 gpm could be discharged in the winter; 5,250 gpm in the spring; and 1,600 gpm in the summer. For this reason three sets of models were conducted for each scenario in this analysis; one for each season. A summary of model inputs is provided on Table Hydro-1 to Hydro-3 in the Hydrology Appendix.

A summary of modeled historical flow, EC and SAR values are provided in Table 3.4.1-2. A summary of the modeled existing flow, EC and SAR values are provided in Table 3.4.1-3.

Table 3.4.1-2: Modeled Historical Surface Water Conditions

	Flow Conditions	Historical-Winter			Historical-Spring			Historical-Summer		
		Flow (cfs)	EC (uS/cm)	SAR	Flow (cfs)	EC (uS/cm)	SAR	Flow (cfs)	EC (uS/cm)	SAR
Tongue River at State Line	7Q10	76	974	0.87	118	806	0.74	36	1342	1.15
	LMM	175	681	0.64	303	538	0.52	171	687	0.64
	HMM	225	611	0.58	1597	263	0.28	450	454	0.45
Tongue River Below Dam	7Q10	70	812	0.99	70	812	0.99	71	809	0.99
	LMM	171	651	0.83	221	611	0.78	269	582	0.75
	HMM	250	593	0.76	1408	387	0.54	565	485	0.65
Tongue River at Birney Day School	7Q10	73	983	1.38	73	983	1.38	74	978	1.38
	LMM	173	728	1.04	225	665	0.95	235	655	0.94
	HMM	209	682	0.97	1089	384	0.56	542	489	0.71

Table 3.4.1-3: Modeled Existing Surface Water Conditions

	Flow Conditions	Modeled Existing-Winter (820_0 gpm)			Modeled Existing-Spring (820_0 gpm)			Modeled Existing-Summer (820_0 gpm)		
		Flow (cfs)	EC (uS/cm)	SAR	Flow (cfs)	EC (uS/cm)	SAR	Flow (cfs)	EC (uS/cm)	SAR
Tongue River at State Line	7Q10	80	999	1.18	122	829	0.98	40	1357	1.61
	LMM	179	700	0.83	307	551	0.65	175	707	0.83
	HMM	229	628	0.74	1601	266	0.31	454	464	0.55
Tongue River Below Dam	7Q10	73	829	1.22	73	829	1.22	74	827	1.22
	LMM	174	666	0.99	224	625	0.93	272	595	0.88
	HMM	253	606	0.90	1411	392	0.59	568	494	0.74
Tongue River at Birney Day School	7Q10	77	1000	1.62	77	1000	1.62	78	996	1.61
	LMM	177	743	1.20	229	678	1.09	239	667	1.07
	HMM	213	695	1.11	1093	390	0.61	546	499	0.80

Values in parentheses represent the rate to be discharged under MPDES permit MT-0030457 (untreated) followed by the amount to be discharged under MT-0030724 (treated).
Other discharges accounted for include the PRG discharge downstream from the Tongue River Dam (350 gpm), the Wyoming treated (600 gpm) and untreated (225 gpm) discharges, and discharges from the Coal Mines (variable).

The existing conditions during LMM flows at the Birney Day School station show that vs. historical conditions there has been a 2.0% increase in flow, a 2.1% increase in EC, and a 15.0% increase in SAR. During 7Q10 flows there has been a 6.1% increase in flow, a 1.8% increase in EC, and a 16.9% increase in SAR.

A noticeable increase in either EC or SAR has not been observed in USGS monitoring data since the start of CBNG production (Bobst, 2005 - http://www.mt.blm.gov/mcfo/cbng/Tng_Rvr_04.pdf). Charts of EC and SAR vs. Flow which show both monitoring and modeling data are included in the Hydrology Appendix. As these charts show, the modeled result of CBNG discharges to date would be expected to be within the natural scatter of the data, which is in line with the conclusion that no measurable increase in EC or SAR has been observed. Recent monitoring data for both EC and SAR are less than the modeled existing conditions, indicating that the model is somewhat conservative (see Hydrology Appendix).

Prior to issuance of the MPDES permits for this project, an analysis must be conducted by the MDEQ in relation to all existing surface water quality criteria. The Montana Board of Environmental Quality has established surface water standards for EC and SAR under the Montana Water Quality Act. These standards have been reviewed and approved by the EPA, and therefore have Clean Water Act standing. The Northern Cheyenne Tribe has also adopted surface water quality standards for EC and SAR. The Northern Cheyenne Tribe has not been granted "Treatment as a State" status by the EPA; therefore, the EPA has not reviewed these standards. As such, the Northern Cheyenne numerical standards do not have Clean Water Act standing; however, they do set out the Tribe's considered determination of the water quality needed to protect irrigated agriculture on the Reservation (Greystone and ALL, 2003), and to protect native plant species that have cultural significance and are integral in ceremonial and traditional aspects of the Northern Cheyenne Tribe. Therefore, the Northern Cheyenne standards provide reasonable criteria against which to compare the resulting water qualities. These various standards are summarized in Table 3.4.1-4.

Table 3.4.1-4: Surface Water EC and SAR Standards for the Tongue River

	Monthly Mean SAR	Inst. Max SAR	Monthly Mean EC (µS/cm)	Inst. Max EC (µS/cm)
MDEQ Irrigation Season[1] Standards	3	4.5	1000	1500
MDEQ Non-Irrigation Season[1] Standards	5	7.5	1500	2500
Northern Cheyenne Irrigation Season[1] Standards; Southern Boundary	---	2	1000	2000
Northern Cheyenne Non-Irrigation Season[1] Standards; Southern Boundary	---	2	---	2000

1: The Irrigation Season specified by the MDEQ is from March 1st to October 31st while the Irrigation Season specified by the Northern Cheyenne is from April 1st to November 15th.

For the purposes of this impact analysis, the high mean monthly and low mean monthly results are compared to the mean monthly standards, while the 7Q10 result are compared to the instantaneous maximum standards. The results from the analysis during the winter trimester will be compared to the non-irrigation season standards, while the spring and summer results will be compared to the irrigation season standards. The existing water quality at all of the stations modeled meets the applicable water quality criteria established by the MDEQ and Northern Cheyenne for EC and SAR (see Tables 3.4.1-3 and 3.4.1.4).

For more information regarding surface water, refer to the MT FEIS Chapter 3, Affected Environment, pages 3-22 through 3-31 (BLM, 2003), the Water Resources Technical Report (ALL, 2001), the Surface Water Quality Analysis Technical Report (SWQATR) (Greystone and ALL, 2003), and the 2004 Overview of Surface Water Monitoring Data for EC and SAR in the Tongue River Watershed (Bobst, 2005; http://www.mt.blm.gov/mcfo/cbng/Tng_Rvr_04.pdf). Real time and historical monitoring data for the Tongue River are also available from the USGS at http://tongueriver monitoring.cr.usgs.gov/index.htm.

3.4.2 Groundwater

All of the coal seams proposed for development under the Deer Creek North and Pond Creek PODs are contained within the Tongue River Member of the Tertiary Fort Union Formation. The Tongue River member may contain 15 to 20 or more coal seams (Deer Creek North POD; Hydrogeology section). Three coal seams are proposed for development under these PODs; the Dietz, Monarch, and Carney. The Dietz seam is typically split into three beds (D1, D2 and D3). Different nomenclature is sometimes used to identify these coals; the D1 is also called the Anderson, the D2 is also called the Upper Dietz, the D3 is also called the Lower Dietz, the Monarch is also called the Canyon, and the Carney is also called the Cook. Artesian pressure within these coal seams may range from 50 to 600 feet above the top of the seams, with pressure increasing with depth (Wheaton and Metesh, 2002).

In the Deer Creek North project area, the D1 coal seam is approximately 20 feet thick, the D2 coal seam is approximately 11 feet thick, and the D3 coal seam is approximately 16 feet thick. The Monarch coal seam is approximately 19 feet thick and the Carney coal seam is approximately 13 feet thick.

In the Pond Creek project area, the Monarch coal seam is approximately 18 feet thick and the Carney coal seam is approximately 21 feet thick.

Within the Deer Creek North POD area the proposed CBNG wells are anticipated to be drilled to depths ranging from approximately 99 feet to 1,061 feet below ground surface (ft-BGS) into the Dietz, Monarch and Carney coal zones (see Appendix A). Of the 172 proposed federal and fee CBNG wells proposed under the Deer Creek North POD, 8 would be finished in the D1 coal seam, 18 would be finished in the D2 coal seam, 50 would be finished in the D3 coal seam, 48 would be finished in the Monarch, and 48 would be finished in the Carney. These wells would be drilled from 50 surface locations with elevations ranging

from 3,458 to 4,095 feet above mean sea level (ft-amsl).

Within the Pond Creek POD area the proposed CBNG wells are anticipated to be drilled to depths ranging from approximately 278 feet to 914 ft into the Monarch and Carney coal zones (see Appendix A). Of the 76 proposed federal and fee CBNG wells proposed under the Pond Creek POD, 35 would be finished in the Monarch, and 41 would be finished in the Carney. These wells would be drilled from 43 surface locations with elevations ranging from 3,655 to 4,085 ft-amsl.

When CBNG is produced, the groundwater levels in the coal seams are drawn down to near the top of the coal seams and then held at that level. This reduces the hydrostatic head within the coal seam and allows the methane to become desorbed from the coal surface and flow to the well. Dewatering of the coal is not desired since this would require excessive pumping of water due to the advent of unconfined conditions (i.e. actual dewatering of the pore spaces vs. reducing the pressure within the coal seam). Also, dewatering would cause the cleat (fractures) within the coal to close up and inhibit the flow of methane to the well. As a result of holding the hydrostatic head just above the top of the coal seam (a constant head situation), the rate of water production per well must decrease over time as the pressure within the aquifer is reduced over an increasing geographic area.

Any drawdown that occurs within the developed coal seam would primarily affect that coal seam, and would not noticeably extend to the overlying or underlying formations. The coals within the Tongue River member of the Fort Union formation are typically bounded by clay rich strata, and as such the vertical hydraulic conductivity above and below these units are very low (Wheaton and Donato, 2004a). Wheaton and Metesh (2002) have noted that "Even a very small vertical hydraulic conductivity value can have a very strong effect. However, based on conditions near Decker, vertical leakage from units near ground surface is thought not to be a major factor. There, drawdowns in coal beds pass un-interrupted beneath perennial streams (Squirrel Creek and Tongue River) and the associated alluvial valley floors. Water-table levels in the alluvium and a shallow sandstone unit have not responded to coal-mine induced drawdown."

Based upon the results of 370 aquifer tests, Wheaton and Metesh (2002) have calculated that the geometric mean horizontal hydraulic conductivity (K) values of the coal seam aquifers in the Fort Union Formation is 1.1 feet per day. Mean storativity (S) values of these coals are approximately $9x10^{-4}$ (storativity is unitless) (Wheaton and Metesh, 2002).

The Montana Bureau of Mines and Geology (MBMG) maintains the Groundwater Information Center (GWIC) database of known wells, springs, and borings in Montana (http://mbmggwic.mtech.edu/). Under current Montana law, drillers are required to provide well logs to MBMG or indirectly to DNRC for all wells drilled within 60 days of drilling the well. The USGS also has the National Hydrologic Database (NHD) dataset for this area (Upper Tongue River) which includes wells and springs. The MBMG and USGS datasets are used to determine the wells or springs which are located within the potential drawdown area.

Coal seam groundwater levels in the CX Field have already been drawn down. Coal mines have contributed to this drawdown over the past 30 years of mining activity. More recently, CBNG development in this area has caused the groundwater levels to be drawn down more notably over the past 4 years. These CBNG wells have been completed in the Dietz, Monarch, and Carney coal seams. Additionally, CBNG wells have also been completed in these coal seams within Wyoming. The area in which these Wyoming CBNG wells are located is shown in the Hydrology Appendix.

Ongoing monitoring indicates that “After 4 years of production from the CX field, water levels have been lowered by 20 feet at distances of less than 1 mile to as much as 2 miles from the edge of the field. Within the production areas, water levels are as much as 150 feet lower than baseline conditions. As production continues, and as field sizes enlarge, greater drawdown is expected to occur and at greater distances from the well field.” (Wheaton and Donato, 2004a). Following the groundwater analysis contained within the Coal Creek POD EA (ALL, 2004; BLM, 2005), it is expected that drawdown will extend, on average, up to approximately 1.6 miles from producing CBNG wells over 20 years. This magnitude of drawdown is also thought to be appropriate for estimating drawdown from coal mines. This estimate is used to buffer the

coal mines, and CBNG wells in Wyoming in order to estimate the total existing area in which the Dietz, Monarch, and Carney coal seams are drawndown. The estimated existing drawdown area is shown on Map Hydro-1 in the Hydrology Appendix. This existing drawdown area has a total area of approximately 213 square miles (mi^2). According to MBMG's GWIC database and the USGS's NHD dataset, there are 26 domestic or public water supply wells, 22 stock wells, 13 industrial or irrigation wells, 10 wells for which the use is not known, 322 monitoring or research wells, 20 unused wells, and 3 springs within the estimated existing 20 foot drawdown contour. These springs and wells are shown on Map Hydro-1, summarized on Table Hydro-10, and listed on Table Hydro-12 in the Hydrology Appendix.

Those wells from both POD's that are finished within the coal seams being developed, and are located within the potential drawdown area, would be anticipated to be impacted by groundwater drawdown. Those springs which emit from the developed coal seam and are located within the potential drawdown area would be anticipated to be impacted by groundwater drawdown. Wells and springs that are impacted by groundwater drawdown would experience a decrease in yields; however, they would not be anticipated to go dry since the coal would remain saturated, but depressurized.

Monitoring will be the key to determining if actual impacts are occurring. Monitoring wells are in place in this area and they are being monitored by the Montana Bureau of Mines and Geology. MBOGC Order 99-99 also requires the monitoring of potentially affected water sources by the CBNG operator. Fidelity has prepared and submitted annual groundwater monitoring reports to the Technical Advisory Committee (TAC) as required by MBOGC Order 99-99.

Fidelity has certified that, in compliance with MBOGC Order 99-99 (Designation of the Powder River Basin Controlled Groundwater Area), executed water mitigation agreements are in place. This Order requires that operators offer water mitigation agreements to owners of water wells or natural springs within one mile of a CBNG field, or within the area that the operator reasonably believes may be impacted by CBNG production, whichever is greater and to extend this area one-half mile beyond any well adversely affected. These mitigation agreements apply to any spring or well adversely impacted by CBNG development.

Wheaton and Donato (2004a) also noted that water levels in the Dietz coal seam near the Tongue River Reservoir have historically responded to changes in reservoir stage. This indicates that there is a hydrologic connection between the reservoir and the coal seams. Wheaton and Donato (2004a) also show in the extrapolated drawdown contours that the 5 foot drawdown contour is approaching the southern end of the Tongue River Reservoir. If lower hydrostatic pressure within the Dietz coal seam reaches the reservoir, leakage from the reservoir to the Dietz coal seam would occur. This leakage would not be likely to result in a noticeable change in reservoir stage, however the introduction of sulfate (SO_4) rich waters into coal seams may result in the loss of the methane resource as the methane (CH_4) is oxidized to carbon dioxide (CO_2).

Fidelity proposes to construct several lined off-channel impoundments. 34E-3490 would be used in conjunction with the treatment facility. Impoundments 23-2191, 33-2191 and 31-2991 would be used in conjunction with the managed irrigation and storage operation. These impoundments would be located in natural depressions that when constructed with an earthen dam, would contain discharged water. There are no wetlands associated with these depressions. The impoundments would provide for a total of approximately 425 acre-feet of storage, and cover approximately 35 acres. The underlying soils consist of low permeability clays, however if permeable soil layers are encountered during construction they will be "plated" with clay material to reduce infiltration. These impoundments would be constructed to prevent any natural run-off from entering and produced water from exiting. A key way would be excavated along the centerline of the dam and then backfilled with compacted clay soil. The dam would be constructed with clay soil in compacted lifts. Low permeability clay would be compacted in lifts on the bottom and sides of each reservoir. The buried flowlines bringing water into the impoundment would be installed to discharge near the middle of the impoundment.

For additional general information on groundwater, refer to the MT FEIS (BLM, 2003), Chapter 3, Affected Environment pages 3-22 through 3-39 (groundwater), the 2D modeling report (Wheaton and

Metesh, 2001) and the 3D modeling report (Wheaton and Metesh, 2002). Groundwater monitoring information relating to CBNG development is also available by logging into MBMG's online GWIC database (http://mbmggwic.mtech.edu/) and using the Ground-Water Projects link. The most recent CBNG groundwater monitoring report (Wheaton and Donato, 2004a) is also available online (http://www.mbmg.mtech.edu/ pdf-open-files/mbmg508.pdf).

3.5 INDIAN TRUST AND NATIVE AMERICAN CONCERNS

"Indian trust assets" means lands, natural resources, money, or other assets held by the Federal Government in trust or restricted against alienation for Indian tribes and individual Indians (Secretarial Order No. 3215, April 28, 2000). Trust is a formal, legally defined, property-based relationship that depends on the existence of three elements: (1) a trust asset(lands, resources, money, etc.); (2) a beneficial owner (the Indian tribe or individual Indian allottee); and (3) a trustee (the Secretary of the Interior). Many things and ideas that are commonly represented in terms of "trust" obligations are not actually part of the Government's trust responsibility toward Indians. Cultural resources on BLM administered lands are not Indian trust assets. Sacred sites on BLM administered lands are not Indian trust assets. Human remains and cultural items subject to NAGPRA are not Indian trust assets (BLM Cultural Resources Handbook H-8210: *Guidelines for Conducting Tribal Consultation*).

No Indian lands or Indian owned leases are present in the POD areas. The Northern Cheyenne Tribe has a Class I PSD Airshed for the reservation and has water rights under the Winters Doctrine on the Tongue River. BLM has a Trust responsibility to ensure that these are not impaired by the proposed developments. The Miles City Field Office has met with the Northern Cheyenne Tribe and sent letters introducing both of the proposed PODS. A review of the documents prepared by the Northern Cheyenne Tribe (NCT 2002) and the Ethnographic Overview of Southeast Montana (Peterson and Deaver 2002) shows no springs or Northern Cheyenne Homesteads listed within the boundaries of the two PODs. The Northern Cheyenne Tribe has previously expressed concerns with impacts to Air Quality, Water Quality, Social and Economic, Impacts to Cultural Resources and Impacts to Wildlife. The concerns raised by the Northern Cheyenne Tribe are addressed in the Air Quality, Cultural Resources, Hydrology, Social and Economic Conditions and Wildlife Sections of this EA.

3.6 LANDS AND REALTY

Deer Creek North POD Area

The Project area is composed of a mixed ownership of both the surface estate and mineral estate. Ownership of the surface estate and mineral estate within the POD area is split between federal (BLM administered) and private. The surface and mineral (oil and gas) acreages for the Deer Creek North POD are found in Table 3.6-1. There are no authorized R/Ws on the proposed affected Federal surface within the POD area. The entire project area is within the Powder River Basin Known Coal Leasing Area (KCLA). There are no withdrawals or mining claims affecting the subject federal land (see Appendix D for a breakdown of acres by section).

Table 3.6-1 Deer Creek North POD Surface & Mineral (Oil & Gas) Ownership

Surface	Acres	Mineral (Oil & Gas)	Acres
BLM	371.72	BLM	3,814.28
Private	7,780.51	Private	4,337.95
Project Area Total	8,152.23	Project Area Total	8,152.23

Pond Creek POD Area

The Project area is composed of a mixed ownership of both the surface estate and mineral estate. Ownership of the surface estate and mineral estate is split between federal (BLM administered) and private. The surface and mineral (oil and gas) acreages for the Pond Creek POD are found in Table 3.6-2. There is one authorized right-of-way on the proposed affected federal surface. Right-of-way MTM-88985 was issued to Fidelity for "off-lease" facilities for their Dry Creek POD in T. 9 S., R. 39 E., Section 13, NW¼SE¼, Section 26, NE¼NW¼ and T. 9 S., R. 40 E., Section 18, Lot 2, and Section 19, NE¼NW¼. New right-of-way MTM94322, which will be issued to Fidelity for the Pond Creek POD, will cross a 40 acre tract of federal surface which is outside the POD area in T. 9 S., R. 39 E., Section 23, NW¼SW¼.

The entire project area is within the Powder River Basin Known Coal Leasing Area (KCLA). There are no withdrawals or mining claims affecting the subject federal land.

Table 3.6-2 Pond Creek POD Surface & Mineral (Oil & Gas) Ownership

Surface	Acres	Mineral (Oil & Gas)	Acres
BLM	1,109.18	BLM	5,734.52
Private	7,339.70	Private	2,714.36
Project Area Total	8,448.88	Project Area Total	8,448.88

If permitting and/or implementation of the produced water treatment facility is delayed for Deer Creek North and/or Pond Creek, Fidelity would construct two containment reservoirs (23-2191 and 33-2191) on federal surface in the NE¼SW¼ and NW¼SE¼, Section 21, T. 9 S., R. 41 E. Three rights-of-way were authorized for Fidelity's Coal Creek POD in T. 9 S., R. 41 E., Section 21, SW¼NE¼, S½NW¼, SW¼, W½SE¼, in the area of this proposed reservoir. The authorized rights-of-way are as follows: 1) MTM93705 issued to Fidelity for buried poly natural gas pipelines, buried poly water lines, buried powerlines, and access roads; 2) MTM93792 issued to Powder River Energy Corporation for a buried powerline and access road; and 3) MTM94037 issued to Bitter Creek Pipelines, LLC for buried steel gas lines and an access road. There are 360 acres of federal surface and 640 acres of federal minerals (all minerals) in Section 21, of T. 9 S., R. 41 E. (See Appendix D for a breakdown of acres by section)

3.7 LIVESTOCK GRAZING

Livestock grazing is the principal economic use of land in the project area. There are two livestock operations that operate within the Deer Creek North POD area. Currently, the livestock operations run approximately 520 cow/calf pairs. There are four livestock operations that operate within the Pond Creek POD area. Those livestock operations run approximately 500 cow/calf pairs and some yearlings. The livestock seasons of use varies depending on each operation. Available water is somewhat limiting to these livestock operations.

3.8 RECREATION AND VRM

Recreational use in the vicinity of the PODs primarily comes from the Tongue River Reservoir. The reservoir attracts a large number of boaters and fisherman to the area and is located approximately within 2 miles of the projects boundary. The major recreational use within the projects boundaries comes from the fall hunting season of big game; however this use is minimal due to limited public access. These and other recreational uses of the area are considered casual, because the public cannot access public land without private surface owner permission.

The visual resources landscape character, in the Decker area, would be managed under a Class III Management objective. It is not unique in character, but the overall condition of the area is pastoral and rural, partially retaining the existing character of the landscape. Evidence of man is slight to moderate. Although non-federal land is not considered under any visual resource management system, the entire landscape is considered when assessing the management class. Activities of the Decker area that have modified the visual quality from a type Class I or Class II situation include the following: Decker Coal (including expansion), Spring Creek Coal (including expansion) and the Montana CBNG development (including the CX Field and the Powder River Gas-Coal Creek Project).

3.9 SOCIAL AND ECONOMIC CONDITIONS

The project areas are located in the southeastern corner of Big Horn County. The Deer Creek North POD is 1-2 miles east/southeast of the Tongue River Reservoir, and just east of the East Decker mine. It is twelve miles east of the Crow Reservation, approximately twenty miles south of the Northern Cheyenne Reservation and thirty miles by paved road from Sheridan, Wyoming. The Pond Creek POD is 2-3 miles west/southwest of the Tongue River Reservoir, just south of the Spring Creek mine and west of the West Decker mine. It is five miles east of the Crow Reservation, approximately twenty miles south of the Northern Cheyenne Reservation and twenty-five miles by paved road from Sheridan, Wyoming. A description of the social, economic and fiscal conditions on the Reservations and Big Horn and Rosebud Counties are found in the Affected Environment Chapter 3 and the Socioeconomic Appendix of the 2003

Statewide MT FEIS. A description of the social, economic and fiscal conditions in Sheridan and Sheridan County, Wyoming are found in the Affected Environment Chapter 3 of the 2003 Buffalo Field Office Plan Amendment FEIS. The proposed action is to drill and produce the Carney, Monarch and Dietz coal zones. The MBOGC reported natural gas production in Big Horn county in 2003 was 7,229,945 MCF (DNRC Annual Review 2003 Page 12-1), approximately 9 percent of total statewide production. However, Oil & Gas production taxes contributed less than one-tenth of one percent of County revenues in FY 1999 (MT FEIS 2003, Socioeconomics Appendix C, Table SEA-1). The Mineral Management Service reported Big Horn County Federal gas production of 258,209 MCF in FY2001, latest data available, with royalty payments of $118,646.

3.9.1 Environmental Justice

(All data is based on the 2000 Census)
Big Horn and Rosebud Counties include Indian reservations with substantial Native American populations. In Big Horn County, where the project is located, the population is 60 percent Native American. This county includes most of the Crow Reservation and part of the Northern Cheyenne Reservation. Slightly over thirty percent of Rosebud County is Native American. This county is located north of the project area and includes the part of the Northern Cheyenne Reservation not located in Big Horn County. In 2000 over 5,000 Native Americans lived on the Crow Reservation and over 4,000 Native Americans lived on the Northern Cheyenne Reservation.

In 2000, 24% of the population living in Big Horn County and 17% of the population in Rosebud County had incomes below the poverty level. These figures compare to a state figure of 13% and reflect the relatively large numbers of persons on the reservations living in poverty.

3.10 SOILS

Soils within project area were identified from the *Soil Survey of Big Horn County Area, Montana* (USDA, 1977). The soil survey was performed by the Natural Resource Conservation Service (NRCS) according to National Cooperative Soil Survey standards. Pertinent information for analysis was included in Fidelity's Plan of Development from the published soil survey and the National Soils Information System (NASIS) database for the area. Information in the Plan of Development includes a soil map, general soils descriptions, official series descriptions, chemical properties, physical properties, rangeland productivity, plant communities, and erosion related attributes.

The soils physical and chemical properties as well as spatial distribution within the POD boundaries were evaluated to assure soil health and productivity are maintained or effects minimized. The soils and impacts were evaluated using the NRCS Soil Data Viewer ArcView extension using NASIS data.

Soils in the project areas have developed in colluvium and residuum derived from the Tongue River Member of the Tertiary Fort Union Formation and the Eocene Wasatch Formation. Lithology of these units consists of light to dark yellow siltstone and sandstones with coal seams in a matrix of shale. In some areas, the near surface coals have burned, baking the surrounding rock, producing red, hard fragments called clinker. Differences in lithology and resistance to weathering have produced the topographic and geomorphic variations seen in the area. Higher ridges and hills are often protected by an erosion-resistant cap of clinker or sandstone. Soils within the area are distributed according to differences in parent material - both residual and depositional, elevation, moisture, and topographic slope and position.

Soils are deep, greater than 40 inches, on alluvial fans, basins, and valley alluvium. Shallow soils, less than 20 inches, occur on plains and ravines underlain by sandstone, siltstone, and shale bedrock as well as in areas with steeper topography. Moderately deep soils are those between 20 and 40 inches deep; these soils generally lie on residual upland plains and relatively gentle sideslopes.

Official Soils Descriptions for these series include taxonomy, horizon descriptions, range of characteristics and other information. Official Soil Descriptions are available in the Plan of Development or on line at: http://soils.usda.gov/technical/classification/osd/. Permeability, depth classes, and drainage classes and other classifications are defined in National Soil Survey Handbook available at: http://soils.usda.gov/technical/handbook/.

Soil series potentially affected in the area include:

Allentine soils consist of very deep, well-drained soils that formed in alluvium. These soils are on terraces. Slopes are 0 to 8 percent.

Alice soils consist of very deep, well drained, moderately rapidly permeable soils on upland hillslopes and river valley terraces. They formed in moderately coarse textured alluvium and windblown material. Slopes range from 0 to 15 percent.

Arvada soils consist of very deep, well drained soils formed in alluvium and colluvium derived from sodic shale. These soils are on alluvial fans, fan remnants, fan terraces and hillslopes. Slopes are 0 to 25 percent.

Busby soils consist of very deep, well drained soils that formed in sandy alluvium, eolian material, or residuum derived from semiconsolidated sandstone. These soils are on stream terraces, alluvial fans, sedimentary plains, and hills. Slopes are 0 to 45 percent.

Cushman soils consist of well drained soils that are moderately deep to bedrock. These soils formed in slopewash alluvium and residuum from interbedded shales and siltstone and fine-grained argillaceous sandstone. Cushman soils are on buttes, fan remnants, hills, piedmonts, ridges and terraces. Slopes are 0 to 20 percent.

Fort Collins soils consists of very deep, well drained soils that formed in mixed eolian sediments and alluvium. Fort Collins soils are on terraces, hills, plains, and alluvial fans and have slopes of 0 to 10 percent.

Frazer soils consist of deep, well drained soils that formed in alluvium. These soils are on stream terraces. Slopes are 0 to 4 percent.

Haverson soils consist of very deep, well drained soils that formed in alluvium from mixed sources. These soils are on floodplains and low terraces and have slopes of 0 to 9 percent.

Heldt soils consist of very deep, moderately well drained, moderately slow to slowly permeable soils that formed in fine textured alluvium on fans, terraces and piedmonts. Slopes are 0 to 25 percent.

Hydro soils are very deep, well drained soils on terraces and footslopes. Slopes are 0 to 15 percent.

Hysham soils consist of deep, moderately well drained, moderately slow to slowly permeable soils developed in calcareous, very strongly alkaline alluvial of mixed mineral origin. These soils are on level to sloping alluvial fans and stream terraces with slopes up to 15 percent.

Korchea soils consist of very deep, well drained, moderately permeable soils that formed in stratified alluvium. These soils are on flood plains and low stream terraces and have slope ranging from 0 to 6 percent.

Lavina soils consist of shallow on upland bedrock plains with slopes of 0 to 30 percent. They formed in calcareous, fine-loamy, transported materials or residuum of mixed rock sources overlying hard sandstone.

Lismas soils consist of shallow, well drained soils formed in residuum weathered from clay shale on ridges and hills. Permeability is very slow. Slopes range from 3 to 100 percent.

Lohmiller soils consist of very deep, well drained soils formed in alluvium. Permeability is slow or moderately slow. Slopes range from 0 to 8 percent.

Mcrae soils consist of deep, well drained soils formed are in calcareous loam alluvium over sedimentary rocks. These soils are found on terraces of rivers and streams, alluvial fans in valleys and footslopes in the

uplands. Slopes range from 0 to 12 percent.

Midway soils are shallow, well drained soils that formed in residuum and slope alluvium from calcareous platy shale. Theses soils formed on ridge crests, mesas, plains and hills in shale uplands. Slopes range from 0 to 40 percent.

Morton soils consists of moderately deep, well drained, moderately permeable soils that formed in material weathered from soft calcareous silty shales, siltstones and fine grained sandstones. These soils are on uplands and have slopes of 0 to 15 percent.

Nelson soils are moderately deep, well drained soils that formed in residuum from soft, calcareous sandstone. These soils formed on hill sides and ridges with slopes from 2 to 12 percent.

Olney soils consist of very deep, well drained soils that formed in eolian material. Olney soils are on hills and plains and have slope gradients of 0 to 15 percent.

Pierre soils are moderately deep, well drained soils formed in clayey residuum weathered from shale bedrock on uplands. Permeability is very slow. Slopes range from 0 to 30 percent.

Spearman soils are moderately deep, well drained soils formed in loamy materials weathered from underlying hard red clinker. Spearman soils are on nearly level to rolling uplands with slopes of 0 to 45 percent.

Renohill soils are well drained soils that are moderately deep to soft bedrock. These soils formed in alluvium, colluvium and residuum. Renohill soils are on bedrock controlled plateaus, hills and ridges. Slopes are 0 to 30 percent.

Terry soils consists of moderately deep, well drained rapidly permeable soils that formed in parent sediments weathered residually from underlying soft sandstone. Terry soils are on hills and ridges and have slopes of 0 to 30 percent.

Thedalund soils are moderately deep, well drained, moderately permeable soils formed in thick calcareous alluvial materials. Thedalund soils are on hills and ridges and have slopes of 0 to 30 percent.

Thurlow soils are very deep, well drained soils that formed in calcareous clay loam unconsolidated materials. These soils formed in valleys on river and stream terraces with slopes from 0 to 15 percent.

Travessilla soils are shallow to very shallow, well drained soils that formed in calcareous eolian sediments and material weathered from sandstone. These soils are on hills, cuestas, scarps and mesas with slopes ranging from 0 to 75 percent.

Wibaux soils consist of very deep, well drained soils formed in colluvium and alluvium derived from porcelanite. Wibaux soils are on hillslopes, knolls and ridges. Slopes range from 0 to 75 percent.

Winnett soils consist of deep, well drained soils that formed in alluvium derived dominantly from shale. Winnett soils are on alluvial valley floors with slopes from 1 to 3 percent.

Hydrologic groups range from A to C indicating low runoff potential, however rutting hazard is high due to low soil strength.

Fort Collins loam, 2 to 4 percent slopes, Haverson loam, 0 to 2 percent slopes are considered prime farmland if irrigated. There are no hydric soils in the area. There is no flooding or ponding hazard for these soils.

Impoundments:
Permeability, depth classes and drainage classes and other classifications are defined in National Soil

Survey Handbook available at: http://soils.usda.gov/technical/handbook/.

Surface soils are described below for the proposed impoundments. Soils are commonly described and characterized to five feet. While surface soils are a good indicator of subsurface lithology, further investigation must occur to determine impoundment site suitability. Soil parent material in this region can change rapidly both rapidly and vertically. Impoundment suitability must ultimately be determined by excavation and analysis.

23-0299; Re, Wy
The existing off-channel impoundment, 23-0299, extends over two soils, both having high clay content resulting in low permeability. These two soils are the Renohill and Winnett series. Renohill and Winnett are silty clay loams with paralithic bedrock at 20 to 40 inches. The Winnett complex contains the Bone series, which is clay with a depth greater than 60 inches. Permeability for these soils is considered to be slow to impermeable. Surface and near surface clay content at this site is anticipated to limit subsurface infiltration; however, the impoundment would be lined with native clay to prohibit infiltration of stored water.

34E-3490; Mve, MVf
The site of the proposed off channel impoundment 34E-3490 extends across Midway-Thedalund complex, rolling and Midway-Thedalund complex, hilly. Midway is silty clay with shallow depth to paralithic bedrock and is considered impermeable at depth. Thedalund is loam with a shallow depth to paralithic shale bedrock and is considered impermeable at depth. Surface and near surface clay content at this site is anticipated to limit subsurface infiltration; however, the impoundment would be lined with native clay to prohibit infiltration of stored water.

44-3490; Mve
The site of the proposed off-channel impoundment, 44-3490, is in an area mapped as the Midway series. The Midway soil is silty clay with a moderate shrink-swell potential, low permeability, and bedrock at a depth of 20 inches. The Midway series is considered impermeable at depth. The surface and near surface clays at this site are anticipated to limit subsurface infiltration; however, the impoundment would be lined with native clay to further prohibit infiltration of stored water.

23-2191 and 33-2191; Hnf, The
The site proposed off-channel impoundments, 23-2191 and 33-2191, extends across two soil units: the Hydro silty clay loam and Thedalund-Midway complex. The Hydro series is silty clay loam with a depth to bedrock of greater than 60 inches. Hydro has a moderately slow to slow permeability. Thedalund is loam with a depth to shale bedrock of 20 to 40 inches. Midway is silty clay with a depth to bedrock of 20 inches. Midway and Thedalund soils are considered impermeable at depth. Testing by excavation to depths of 13 to 19 feet at 23-2191 showed vertical lithology changes between siltstone, sandstone, and shale. The impoundments would be lined with native clay to prohibit infiltration of stored water.

31-2991; Hna, MVf
The site of the proposed off-channel impoundment 31-2991, extends across two soil units: Hydro loam and Midway-Thedalund complex. Hydro series is loam and has depth to bedrock of greater than 60 inches. Hydro has a moderately slow to slow permeability. Midway is silty clay with a depth to bedrock of 20 inches. The Thedalund is loam with a depth to shale bedrock of 20 to 40 inches. Midway and Thedalund soils are considered impermeable at depth. Testing by excavation to depths of 14 to 18 feet at this site showed vertical lithology changes between siltstone, sandstone, shale, lignite, and clinker.
The impoundment would be lined with native clay to prohibit infiltration of stored water.

Land Application Area Soils:
Two areas have been selected as managed irrigation sites with native vegetation for the application of water produced with CBNG. One area is adjacent to the existing 7 Brothers 35 compressor site and the other is along Badger Creek. Both application units are near sites selected for the construction of impoundments. Soils in the area adjacent to 7 Brothers 35 Battery are predominately the Arvada series. Soils in the area along Badger Creek are predominately the Haverson series. Soils in the managed irrigation areas are

considered suitable for irrigation under normal agronomic conditions as outlined in USDA-NRCS National Engineering Handbook Part 652 -Irrigation Guide Chapter 2. These sites were selected using the procedures in Protocol for Evaluating, Designing, Operating and Monitoring Managed Irrigation Systems for Coal Bed Natural Gas Produced Water: Tongue River – Badger Hills Project, Bighorn County, Montana (Harvey, 2003) and summarized in the Soils Appendix H. Soils and effects from irrigation will be monitored and management processes adjusted to address effects on and adjacent to the managed irrigation sites. Information about soil series and characteristics is included in Fidelity's Plan of Development.

3.11 VEGETATION

The project areas are in upland communities dominated by grasses but include shrubs and trees. Dominant upland species include bluebunch wheatgrass (*Agropyron spicatum),* western wheatgrass (*Agropyron smithii),* green needlegrass (*Stipa viridula),* blue grama *(Bouteloua gracilis),* needle and thread (*Stipa comata),* prickly pear cactus (*Opuntia spp.),* big sagebrush (*Artemisia tridentata),* ponderosa pine (*Pinus pondersosa),* Rocky Mountain juniper (*Juniperus scopulorum).* Differences in dominant species within the project area vary with soil type, aspect and topography. The Deer Creek North POD area also includes some dryland hay fields along Deer Creek. Many years ago these fields were planted to crested wheatgrass (*Agropyron cristatum)* and alfalfa (*Medicago* species). Some native grasses are beginning to return to these fields.

There are no known threatened or endangered plant species in the project area. However, three plant species identified on the Montana Plant Species of Concern list have been recorded in outlying areas (Barton & Crispin, 2003). Two species Barr's milkvetch (*Astragalus barrii*) and Nuttall's desert-parsley (*Lomatium nuttallii*) are both identified as Montana Species of Concern and regional endemics and are designated Watch Species by the BLM in Montana. The third plant species, Woolly twinpod *(Physaria didymocarpa* var. *lanata*), is a regional endemic.

Habitat for Barr's milkvetch consists of heavy clay (gumbo) knobs, badlands, buttes and barren hilltops. Typically there is sparse shrub cover and sometimes scattered ponderosa pine and Rocky Mountain juniper. Habitat for Nuttall's desert-parsley consists of open rocky slopes of sandstone, siltstone or clayey shale in open pine woodlands with sparse vegetation. Habitat for Woolly twinpod consists of sandstone outcrops, scoria-shale slopes with a sparse cover of ponderosa pine and Rocky Mountain juniper. Common species found in association with the three plant species of concern include blue bunch wheatgrass, western wheatgrass, big sagebrush and rabbitbrush (*Chrysothamnus spp.),* ponderosa pine, Rocky Mountain juniper. Habitat for all three plant species of concern exist in the project area. Surveys conducted by the Montana Natural Heritage Program indicate that these species do not occur predictably and regularly in apparently suitable habitat and that additional populations likely exist for all three species (Barton & Crispin, 2003).

Irrigated alfalfa occurs in the western portion of Section 23 along the Tongue River.

3.11.1 Invasive Species

Noxious weed infestations were discovered through a search of inventory maps and/or databases or during subsequent field investigation by the proposed project proponent on the Deer Creek North POD. Leafy spurge (*Euphorbia esula*) is common in the area and is spreading rapidly. Currently occupying two known sites, it is reasonable to expect this species could occur in other areas of Deer Creek North or in Pond Creek. However, at this time, there have been no infestations found in the Pond Creek POD. It is possible for any weed species to invade into any of the areas of surface disturbance.

3.12 WILDLIFE

The project area provides habitat for a diversity of wildlife species. Habitat within the Deer Creek POD and Pond Creek POD areas has some existing habitat alterations from human activity, including previous CBNG development, Decker and Spring Creek Coal Mines, and other than uses including hunting and livestock grazing.

Wildlife surveys were conducted throughout the project area in 2004 by Hayden-Wing Associates (HWA). The reports, *Fidelity Exploration and Production Company Pond Creek POD Wildlife Surveys 2004,* and

Fidelity Exploration and Production Company Deer Creek POD Wildlife Surveys 2004, were submitted to the BLM on February 28, 2005. Additionally, BLM biologists evaluated the area for wildlife values. BLM contracted with Greystone Environmental Consultants to complete raptor and prairie dog town surveys in the area of ongoing and potential CBNG development in southern Big Horn County in Montana. The following sections describe wildlife values in the project area.

3.12.1 Threatened and Endangered Species

Two wildlife species listed as threatened or endangered, under the Endangered Species Act, occur or have the potential to occur within these locations. These include the threatened bald eagle and the endangered black-footed ferret.

Bald eagles are the only known federally listed threatened or endangered species known to inhabit this area. The Tongue River corridor is considered important bald eagle habitat. Currently, the stretch of the Tongue River from just south of the Montana/Wyoming border to Birney, MT supports five active bald eagle nests. Bald eagle nests have not been found within the immediate project area, although three bald eagle nests are located within a six mile radius of the Deer Creek North POD. The nearest bald eagle nest is located approximately 4 miles southwest of the Deer Creek North POD. The same three nests are located within an eight mile radius of the Pond Creek POD. The nearest nest is approximately 2.5 miles to the southeast of the Pond Creek POD.

Bald eagles winter within the Tongue River corridor. From January 2003 through February 2005, several flights per year have been conducted by HWA and BLM biologists to inventory potential winter roost sites and identify winter roost habitat. The stretch of the Tongue River from the Montana/Wyoming state line to Birney, MT has been included in the survey area. Up to 50 bald eagles have been observed along this stretch of the Tongue River.

Although no bald eagle nest sites or winter roost sites were identified within the Deer Creek North or Pond Creek POD's, these areas may be used occasionally by bald eagles for foraging and during migration.

The potential for black-footed ferret habitat within the project area was also assessed. According to FWS guidelines for determining suitable black-footed ferret habitat (FWS, 1989), a black-tailed prairie dog complex suitable to support ferrets is defined as an aggregation of two or more neighboring prairie dog towns separated by a distance of less than 4.34 miles and totaling 80 acres or more. The combination of black-tailed prairie dog burrow site density per acre and the acreage of prairie dog towns within the project area are used to determine potential habitat for black-footed ferrets.

Surveys for black-footed ferrets have been conducted within a portion of Fidelity Exploration and Production Company's POD's. Approximately 9 black-tailed prairie dog towns have been surveyed, totaling 550 acres. No black-footed ferrets or their sign were observed during the surveys. (Hayden-Wing Associates, 2004)

3.12.2 Big Game Species

Mule deer are found year round in the project area. "Crucial" winter range is identified within both the Deer Creek North and Pond Creek units. Mule deer and pronghorn winter range observations were conducted by HWA within and adjacent to the Pond Creek and Dry Creek POD's. The numbers of mule deer observed ranged from 86 to 119 during three separate winter surveys within this area. The number of pronghorn observed ranged from 16 to 95 during the same survey period.

Spring surveys have also been conducted in 2004 and 2005, approximately 20 miles north of the project area, along 5-6 mile belts on both sides along the southern boundary of the Northern Cheyenne Reservation. This survey encompassed approximately 250 square miles and was designed to obtain mule deer estimates. Observations of other game species were also recorded. Within this survey area, the observed density of mule deer averaged approximately 1.0 per square mile (Mackie, 2004). Densities varied locally from less than 1.0 to 3.0 per square mile. Comparatively similar observations were recorded in 2005.

White-tailed deer use the Tongue River corridor and associated side drainages with preferred habitat. Habitat for white-tailed deer is limited within the project area.

During previous BLM surveys, elk have been observed from the Tongue River, along the state line, east to the Badger Hills, and north into the Tongue River breaks, continuing into the Custer National Forest. Elk have not been observed occupying habitat within or adjacent to the Pond Creek POD. Elk use habitat in and around the Deer Creek North POD year-round.

Limited potential exists for other big game species to occasionally occupy the POD areas. Species may include black bear, mountain lion and moose. Most likely, this occupancy would occur during movement to preferred habitats elsewhere.

Large mammal movements or migrations through this area are not fully understood. At a local level, it is reasonable to assume that big game, such as mule deer move seasonally from areas of higher elevation into low elevation winter range along the Tongue River corridor.

3.12.3 Upland Game Birds

The Pond Creek and Deer Creek North PODs contain habitat for sage grouse, sharp-tailed grouse, and wild turkeys. Ten documented sage grouse strutting grounds (leks) occur on or within two miles of the Pond Creek POD (Hayden-Wing Associates, 2004). All three leks exist within the POD boundary. Several surveys have been conducted within the project area, including surveys performed by the BLM, HWA, University of MT, Spring Creek Coal Company, and Decker Coal Company. Of the ten leks, seven were occupied in 2004. The combined maximum number of birds found on these seven leks totaled 65 males and 21 hens. (Some leks may have been surveyed once; therefore maximum numbers may not reflect the actual numbers of birds in the area) Habitat does exist to potentially support sage grouse nesting, brood-rearing, and winter range use within the Pond Creek POD project area.

Twelve documented sharp-tailed grouse dancing grounds (leks) occur on or within two miles of the Pond Creek POD. Only one of the leks, located outside of the POD boundary was occupied in 2004. Nine males and one hen were observed at this lek.

No sage grouse leks are located within the Deer Creek North POD boundary, although two are located within two miles of the POD area. Sage grouse were not observed occupying these leks in 2004.

Eleven sharp-tailed grouse leks are documented on or within two miles of the Deer Creek North POD boundary. Two are located within the POD boundary, one of which was occupied in 2004. A combined total of all leks surveyed revealed 22 males and 5 hens observed on the leks.

Wild turkeys may also use some riparian and/or upland habitats within this area.

3.12.4 Raptors

The project area provides nesting habitat for various species of raptors. Twenty-eight documented raptor nests exist on or within one mile of the Pond Creek POD boundary (HWA, 2004). Those species, which have had active nests at least once within the last two years, include great-horned owls (3) red-tailed hawks (4), golden eagles (2), and burrowing owls (1). Nests/territories classified as inactive within the last two years include great-horned owls (1), prairie falcons (3), and red-tailed hawk (12), burrowing owl (1) and unknown (1). Ten of the twenty-eight nests were found in 2004 and only have one year of nesting related monitoring.

Ten documented raptor nests exist on or within one mile of the Deer Creek North POD boundary (HWA, 2004), (Greystone Environmental Consultants, 2004). Those species which had active nests in 2004 include red-tailed hawks (2), burrowing owls (3), and golden eagles (1). Those species that had inactive nests in 2004 include great horned owls (1), red-tailed hawks (2), and (1) failed red-tailed hawk nest.

3.12.5 Prairie Dogs and Associated Species

The black-tailed prairie dog is a designated BLM Sensitive Species. Black-tailed prairie dog towns provide potential habitat for several raptor species, BLM Sensitive Species (mountain plovers, burrowing owls) and the endangered black-footed ferrets (BLM, 2004 Sensitive Species list). According to HWA surveys, eleven black-tailed prairie dog colonies are located on or partially within the Pond Creek POD area, plus a 1/2 mile buffer. Five of the eleven colonies are located within the POD area and totaled approximately 275 acres. The other six colonies located within or partially within the ½ mile buffer and total approximately 382 acres. Approximately 25 acres are located on private lands within the area affected by the federal action. These towns may be impacted by development related actions. Two prairie dog towns are immediately adjacent to federally managed surface, and may expand onto these areas if conditions permit.

Seven areas of potential mountain plover habitat are located within or partially within the Pond Creek POD area and a ½ mile buffer surrounding the POD area. Three of the seven areas are located within the POD area and total approximately 222 acres. The other four areas total approximately 156 acres. Four of the seven areas were surveyed for mountain plover in 2003. Mountain plovers were not seen or heard during these surveys (HWA, 2004).

Burrowing owls have been observed within and adjacent to the Pond Creek POD area. Hayden Wing surveys reported three burrowing owl nests in or within two miles of the Pond Creek POD area. Only one nest is located within the POD boundary and was classified as inactive in 2004. The other two nests were reported as active in 2004. Another burrowing owl nest, surveyed annually by Spring Creek Mine representatives, was active within the Pond Creek POD area until 2002. The nesting habitat utilized by these burrowing owls, located on private surface/private minerals, was inundated by CBNG water discharged into a containment pond in 2002.

Three black-tailed prairie dog colonies are located within the Deer Creek North POD area, totaling 109 acres in size (HWA, 2004). Approximately 29 acres are part of the federal action, although all are on private surface.

Two areas of potential mountain plover habitat were identified within the Deer Creek North POD. Surveys were conducted within one area in 2004 and no plovers were observed or heard. The other area is scheduled to be surveyed in 2005.

Three active burrowing owl nests were located within the Deer Creek North POD area.

3.12.6 Migratory Bird Species

The Montana Natural Heritage Program conducted baseline bird surveys and identified 104 species of birds as inhabitants of this portion of southeast Montana, and another 55 species as probable/possible inhabitants (Carlsen and Cooper, 2003). The BLM commissioned two separate breeding bird surveys (unpublished reports by USGS and University of Montana) in the project area and surrounding areas in 2001 and 2003. Species, such as Western meadowlarks, lark/clay-colored/Brewer's sparrows, American robins, rock wrens and red-winged blackbirds were considered the most abundant species within and adjacent to the Pond Creek POD area. Appendix B includes a summary of all Montana BLM bird Species of Special Concern, including analysis of potential habitat and possible occurrences of these species in the project area. These species are in low numbers and may not have been documented on recent surveys. Species may include, but not limited to, ferruginous and Swainson's hawks, hairy woodpecker, loggerhead shrike and others (see Appendix B).

3.12.7 BLM Sensitive Species

BLM uses the term Special Status Species (SSS) to identify any species, which has been elevated to a level of management concern. Special Status Species include species listed as threatened, endangered, or proposed for listing under the federal Endangered Species Act (ESA), species listed by the BLM State Director as sensitive, species listed by the state wildlife agency, or species identified by a state heritage program. It is important not to interpret a designation of Special Status Species as exclusively meaning the species is protected by the ESA. BLM State Directors have the authority to identify a list of State Sensitive Species for which additional management concern is directed. The Montana/Dakotas Sensitive Species List was issued July 28, 2004 (Instruction Memorandum No. MT-2004-082).

There are several BLM Sensitive Species of mammals that may occur in the area. Most are extremely rare and/or documentation is nearly non-existent (Foresman, 2001). These include Preble's and Merriam's shrews and spotted and Townsend's big-eared bats. Refer to the table in Appendix B for an accounting of all Montana BLM SSS-listed species.

3.12.8 Fisheries/Aquatics

The main streams and rivers within the Deer Creek North and Pond Creek PODs and associated water management areas (i.e. – discharge, reservoirs and irrigation) include the Tongue River upstream of the Tongue River reservoir and Squirrel, Badger and Deer Creeks. All four of these streams contain aquatic species. The Tongue River Reservoir is located directly downstream of water discharge sites, approximately five surface miles. Other intermittent and ephemeral streams are located within the project area, but for the most part, do not contain aquatic dependent species, except for a few isolated springs and reservoirs.

An amphibian and reptile baseline survey was conducted within the project area by Maxim Technologies (2005). Sensitive aquatic species found included the northern leopard frog, spiny soft shell and Great Plains toad. Other sensitive species including the snapping turtle and Plains spade foot are known to or may exist in the project area. In addition to the above aquatic species, there are other amphibians and aquatic invertebrates common in and along the Tongue River and many of its tributaries.

The amphibian and reptile baseline survey (Maxim Technologies, 2005) found no apparent relationship between water quality parameters and amphibian and reptile detections from the data collected. Higher pH and EC values for certain sample sites did not appear to preclude the presence of herptiles. However, the six sites that were chosen as exhibiting high-quality structural or vegetative habitat characteristics, such as shallows and good vegetative cover, exhibited the highest diversity of aquatic species, the widest range of life stages and the most individuals. Conversely, sites lacking these high quality characteristics produced fewer and sometimes zero herptile observations. This suggests that wetland structure and vegetative cover may currently be as strong an indicator of herptile presence and population viability as water quality parameters within the study area. However, insufficient water quality and quantity data was collected to assess any effects of water quality on herptiles within the study area.

Tongue River (upstream of the reservoir): The Tongue River, upstream of Tongue River Dam, supports a major recreational fishery. Key species include smallmouth bass, sauger and channel catfish. Fifteen fish species have been identified in this portion of the Tongue River (refer to http://maps2.nris.state.mt.us/). There were 14 fish species identified in the river upstream of the Tongue River Reservoir (RM 200.7 to RM 206.7) through electro shocking in 2004. The sauger is the only sensitive fish species within and immediately downstream of the project area.

Macro-invertebrates, fish, periphyton, instream habitat and riparian habitat were surveyed for existing baseline condition at two sites on the Tongue River (between theTongue River Reservoir and the state line) on July 26-27, 2004, (BLM preliminary data, 2004). These two sites are located on the Tongue River at the state line (T. 9 S., R. 40 E., Section 31) and south of Otter Creek Road bridge (T. 9 S., R. 40 E., Section 27). Most of the above data is currently being analyzed and will not be available until July, 2005. Preliminary observations indicated a variety of fish, invertebrates, and amphibians. The summary determination for rating streams (BLM, 1998) indicated the above sites surveyed were functioning at risk and in an upward trend. The upward trend was evident through revegetating streambanks and new shrub/tree recruitment. The impacts attributing to the functioning at risk rating were unstable streambanks and lack of riparian vegetation in some areas. Additional sampling for aquatic invertebrates was completed by the USGS on the Tongue River at the state line (upstream of the reservoir) and the Tongue River at Brandenburg Bridge (approximately 85 - 95 stream miles downstream of the project area) in 2003. In fast-flowing habitats, the most abundant taxa for the site near Brandenburg Bridge were Ephemeroptera (49%) and Tricoptera (27%). The Tongue River at the State Line site consisted of Ephemeroptera (62%), Miscellaneous Diptera (aquatic flies) (12%) and Coleptera (aquatic beetles) (11%).

Tongue River Reservoir: The Tongue River Reservoir is located directly downstream of current discharge.

Key species include black crappie, white crappie, walleye, smallmouth bass, sauger, northern pike and channel catfish. Nineteen fish species have been identified (refer to http://maps2.nris.state.mt.us/) in the reservoir.

FWP has completed fish population, abundance and diversity surveys on the Tongue River Reservoir for the past 40 years. Personal communication with Vic Riggs (FWP) Fish Biologist, 2005) indicated there have been cyclic patterns in fish populations, abundance and diversity over the past 40 years. Currently, these cyclic patterns cannot be attributed to CBNG development or other activities within the Tongue River watershed. Annual reports are available from FWP.

Squirrel Creek: Squirrel Creek is an intermittent stream with perennial pools (the stream may not flow continuously, but perennial water exists in pools throughout its length) and is a tributary to the Tongue River. In 2002 and 2004, fish, macro-invertebrate, periphyton, instream habitat, and riparian habitat were surveyed for existing baseline condition (Confluence, 2003) (BLM preliminary data, 2004). The surveys were completed at the upstream end of the current Dry Creek POD boundary (T. 9 S., R. 39 E., S. 14 (NW¼)) and the downstream end of the current Dry Creek POD boundary (T. 9 S., R. 40 E., S. 29) for approximately 500 meters in each location. The two sites are approximately 7 stream miles apart and are both located downstream of the Pond Creek POD boundary.

Upper Squirrel Creek Site: At the upper Squirrel Creek site; 18 creek chubs, 18 fathead minnows, 50 lake chubs, 5 longnose daces, and 3 white suckers were found during the July 23, 2002, survey. Six Northern leopard frogs and more than 100 crayfish were also found. Aquatic invertebrate data results indicated a taxa richness (measures the overall variety of the macro invertebrate assemblage) of 33 to 36, the highest taxa richness of all the sites in the 2002 study area, and an impairment rating of slight to moderate. The conductivity was 1,440 uS/cm and the sodium absorption ratio was 7.49. The stream was a highly meandering, narrow and deep channel, consistent with Rosgen's E channel classification (1996). This portion of channel was in excellent shape: ample undercut banks and occasional pools provided high quality habitat for fish in this section.

Preliminary results are available for the May 26, 2004, upper Squirrel Creek Site. Fish species included two creek chubs, 48 fathead minnows, one brassy minnow, 14 lake chubs and 34 longnose daces. One Northern leopard frog, 67 crayfish, 1 gopher snake, 1 garter snake, 1 blue heron, 1 leech, and beaver sign were present. No results are available for aquatic invertebrates. The conductivity was 1,510 uS/cm and the sodium absorption ratio was 1.23. This portion of channel was rated to being in Proper Functioning Condition with an abundance of riparian shrub/sedge vegetation: box elder, snowberry, juniper, green ash, plum, rose, golden current, sandbar willow, cottonwoods and sedges/rushes. Instream fish cover was rated over 50 percent. Some livestock use and a ford were present.

Lower Squirrel Creek Site: No fish were found at the lower Squirrel Creek site during the July 24, 2002, survey. Four crayfish were observed. Aquatic invertebrate data results had a taxa richness (measures the overall variety of the macro-invertebrate assemblage) of 18 (a considerable drop from the upstream site) and an impairment rating of moderate. The conductivity was 5,790 uS/cm and the sodium absorption ratio was 48.73. The stream was a meandering channel, consistent with Rosgen's E channel classification (1996). This portion of the channel contained slumped banks which appeared to be healing.

Preliminary results are available for the May 26, 2004 survey of the lower Squirrel Creek Site. Fish encountered included: three fathead minnows and one lake chub. One northern leopard frog, one woodhouse toad and one crayfish were found. No results are available for aquatic invertebrates. The conductivity was 5,930 uS/cm and the SAR was 7.59. This portion of channel was rated as Functioning at Risk, with trend not apparent. The stream has only a few riparian shrubs (snowberry, rose and wild plum), but does contain a sedge/rush component. Streambanks are eroding. Instream fish cover was rated 10 to 30 percent. There is some livestock use and a culvert is located upstream.

As noted above, an increase in conductivity (over 4,000 uS/cm in 2002 and 2004) and SAR (41.24 and 6.36 SAR in 2002 & 2004, respectively) occurred between the two sampling sites on Squirrel Creek. In 2002, data indicated a reduction in taxa richness and a large decrease in fish numbers. In 2004, there was also a

large decrease in fish numbers. The stream has not been analyzed to the extent needed to specifically identify the cause of the change in conditions between the upper and lower sites on Squirrel Creek. However, based upon an analysis by Confluence Consulting, Inc., 2003, (Biological, Physical and Chemical Integrity of Select Streams in the Tongue River Basin) and EA #MT-020-2003-0310 on the Fidelity Exploration CX Field – Fed. 22EM-2599, Fed#3, Fed#2 Wells, there is potential for Squirrel Creek to be impacted by impoundments (reservoirs) located within intermittent and ephemeral draws that flow into Squirrel Creek. The documentation also indicated potential for CBNG water to infiltrate through these impoundments, into the underlying alluvium, which would then flow into Squirrel Creek. These impoundments were constructed primarily for CBNG water storage during initial CBNG development in the area. Few on-channel livestock watering impoundments were constructed prior to CBNG development.

Badger Creek: Badger Creek is an intermittent stream with perennial and is a tributary to the Tongue River. FWP (2004) attempted to survey Badger Creek (RM 2.3 – 2.4) for fish presence. However, the site was dry and a survey was not completed. BLM (2004) surveyed Badger Creek, approximate RM 0.0 to .25. However, the stream did not have a full analysis, similar to Squirrel Creek, due to the dry nature. No fish and most of the water in the channel appeared to result from the high flow of the Tongue River. General observations and a summary determination for rating streams (BLM, 1998) were completed.

Results from general observations included the following. Two isolated pools were found containing no fish. However, two carp were found dead on the streambank. Other aquatic dependant species seen at the site consisted of one leopard frog, damselflies, water boatman, water skippers and springtails (Order Collembola – also called freshwater shrimp).

The summary determination for rating streams (BLM, 1998) indicated this site was functioning at risk with trend not apparent. Impacts that attributed to the functioning at risk rating were channel constraint by a hayfield and invasive species. Riparian vegetation included cottonwood, box elder, salt cedar, sedges and invasive forbs. There was some recruitment of native species within the stream (cottonwood and box elder). However, these trees appeared to have large portions of dead within them.

Deer Creek: Deer Creek is an intermittent stream with perennial pools and is a tributary to the Tongue River Reservoir. General observations were conducted by the BLM on Deer Creek within and downstream of the POD boundary in March, 2005. No official surveys were completed. Current land management within the POD boundary, prior to POD development, consists of ranching and the Decker Coal mine. A total of eight fords, one reservoir on an ephemeral draw, one windmill with trough, two culverts, one pipeline, and one blown-out dike across Deer Creek were located within the floodplain of Deer Creek. In addition, there were wells or test holes located in various locations within the floodplain, of which were distinguished by white plastic pipe and/or corrugated culvert placed vertically. Contour spreader dikes were present within close vicinity to Deer Creek downstream of the Ranch Holme residence,. Riparian vegetation primarily consisted of sedges, rushes and cattails. However, there were a few locations with cottonwoods, Russian olive, box elder, snowberry, chokecherry, snowberry and wild rose. There was approximately 3.5 stream miles of wetted channel within the Deer Creek North POD boundary in March of 2005. Wetland plants and animal species present indicated that for the most part, the wetted portions do not completely dry up in the summer. Aquatic species observed were painted turtles and dead smallmouth bass. Further sampling from FWP (2005) indicated no fish species present. Therefore, the dead smallmouth bass found were most likely winter-killed.

Springs: The existing fields of CBNG development in Montana and Wyoming could impact six springs within the 20 foot drawdown contour over the next 20 years (see Section 3.4.2). These springs have not been surveyed for aquatic species. However, it is reasonable to assume that various aquatic macro-invertebrates and amphibians use these springs to rear and reproduce.

Actions and natural environmental conditions that have contributed to existing habitat and populations of aquatic species: Potential effects to fisheries/aquatics have occurred or may occur from the following current and past activities: Decker Coal Mine, Montana and Wyoming CBNG development, livestock grazing, agriculture/irrigation, Tongue River dam and reservoir, residential areas and existing roads. These actions occur in various degrees throughout the drainage which influences the degree at which aquatic life

is affected. Water quality, erosion and streamflows are identified as parameters that could be changed or impacted and subsequently result in potential effects to aquatic life.

Decker Coal Mine: Coal mining has the potential to affect water quality, erosion, and streamflows. This activity consists of 11,400 surface acres. This is equal to .3 % of the area (3,458,832 acres) within the Tongue River drainage. Due to mitigation requirements, these activities would be minor and not detrimental to aquatic species in relation to effects from erosion. The Decker Mine discharges 3.74 cfs into the Tongue River Reservoir, which is approximately 5.3 percent of the flow at the low monthly 7Q10 (70 cfs) below the dam. This project could have potential effects on habitat or populations.

CBNG development: Past and ongoing CBNG activities have the potential to affect water quality, erosion and streamflows. CBNG development in Montana presently encompasses 35,840 acres (1% of the Tongue River drainage). Currently, in Montana, there is a discharge permit of 1,600 gpm (3.56 cfs) for CBNG produced untreated water (approx. 5.1 percent of the flow at the low monthly 7Q10 (70 cfs) below the dam and 8.3 % (7Q10 of 43 cfs) upstream of the dam (Montana)). However, this permit is currently discharging 820 gpm (1.8 cfs). In addition, there is a treated water permit for 1,122 gpm (2.5 cfs) downstream of the reservoir (approx. 3.6 percent of the flow at the low monthly 7Q10 (70 cfs) below the dam (Montana)). However the current permit is discharging 350 gpm (.78 cfs). Effects to aquatic species are possible from these CBNG activities, due to potential water quality impacts, changes in streamflows, and erosion.

Within Wyoming (the upper portions of the Tongue River watershed), existing CBNG activities are occurring. Treated discharge is currently 600 gpm (1.34 cfs). Untreated discharge is 225 gpm (.5 cfs). Therefore, this activity could have potential effects on habitat or populations.

Livestock Grazing: Livestock grazing occurs over most of the drainage. Potential impacts are increased erosion and higher stream temperatures from reduced riparian vegetation through livestock browsing, breached livestock reservoirs and livestock trailing/loafing. The degree of the effect varies throughout the drainage and depends on the vegetation types, type of grazing system, season of use, topography, fencing, water, forage availability and natural conditions. Livestock grazing could have potential effects on aquatic habitat or populations.

Agriculture/irrigation: Potential impacts from agriculture/irrigation are decreased streamflows, changes in water quality and erosion. Agriculture is primarily limited to dry land farming or irrigated farmland adjacent to perennial streams and rivers. This area is limited primarily by terrain. The amount of flow removed from the Tongue may vary per day based on irrigation needs. However, the most impacted portion of the Tongue River from irrigation withdrawal is downstream of the T&Y diversion at 12 mile dam (approx. 165 miles downstream of the project area). The river is essentially de-watered during a portion of the irrigation season. This can have an affect on spawning fish, such as the sauger and affect the fish and aquatic habitat and populations within the river. Potential effects could occur to aquatic habitat or populations.

Tongue River Dam and Reservoir: The Tongue River Dam and Reservoir regulates the amount of cubic feet per second (cfs) flowing downstream of the dam. As a result, flushing or high peak flows on the Tongue River do not always occur. These flows may be preventing the recruitment of cottonwood and other flushing flow dependant riparian species within the Tongue River floodplain. In addition, Schmitz (FWP, 2004) indicated that during dam reconstruction (which occurred within the past decade) there were periods when no flow was permitted through the dam. This activity could have potential effects on habitat or populations. However, there is a potential benefit to aquatics from the dam and reservoir, as there could be less potential for erosion of streambanks from the lack of high peak flows.

Residential Areas: Effects from residential areas includes erosion and changes in water quality and streamflows. Major residential areas in the watershed include Sheridan, WY, Miles City and Ashland, MT (approximate combined population of 24,375 people). Birney, Decker, Otter, Quietus, Sonnette, Volborg are other very small Montana residential areas in the area. There are also ranch residential areas scattered across the entire watershed. Generally, the Tongue River drainage could be described as sparsely

populated, which reduces the potential for effects on habitat or populations.

Existing roads: Roads have the potential to increase erosion, block fish passage (where culverts are installed) and remove riparian and upland vegetation. It is likely that past road construction activities and current road locations are having some impact on aquatic life.

Determination: The degree of effects from the combination of the above activities within the Tongue River drainage depends on a variety of factors. Some of which are natural. Drought conditions have affected aquatic habitat and populations within the drainage for the past several years. Local geology, severe wildfire and soil composition also influence water quality, streamflows and erosion.

Of the above activities, present CBNG development, the Decker Coal mine, agriculture/irrigation, residential areas, livestock grazing, the Tongue River dam and reservoir, and existing roads present the greatest potential impacts to aquatic habitat and populations. Although difficult to quantify in numerical terms, it is reasonable to expect, with the magnitude of activities there would be some impacts to most aquatic species residing in the area.

3.12.9 West Nile Virus

West Nile Virus (WNV) is a mosquito-borne disease that can cause encephalitis and other brainstem diseases in humans and potentially is a major threat to some vertebrate wildlife populations. WNV was identified as a mortality factor in sage grouse populations in the Powder River Basin in 2003. WNV is spread when mosquitos feed on infected birds and then people or animals. Research is ongoing which is analyzing CBNG development impacts to sage grouse populations in southeast Montana and northeast Wyoming.

Mosquitoes can potentially breed in any standing water that lasts for more than 4 days. Surface water availability has increased with CBNG development in the Powder River Basin, which includes the proposed project area. WNV has been identified in mosquitoes trapped in and around CBNG produced water reservoirs in the vicinity of the sage grouse mortalities (B. Walker, personal communication). Research on this issue is currently being conducted by several entities (WY Veterinary Lab, University of Montana, Montana State University, USDA, and the University of Alberta).

Other factors that may be influencing WNV are the irrigation adjacent to the Tongue River, stock water reservoirs and troughs, natural wetlands and environmental influences.